THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVIII. No. 2172.] LONDON, DECEMBER 27, 1904. [56TH YEAR. PRICE 6d.

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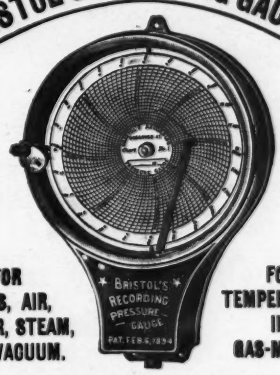

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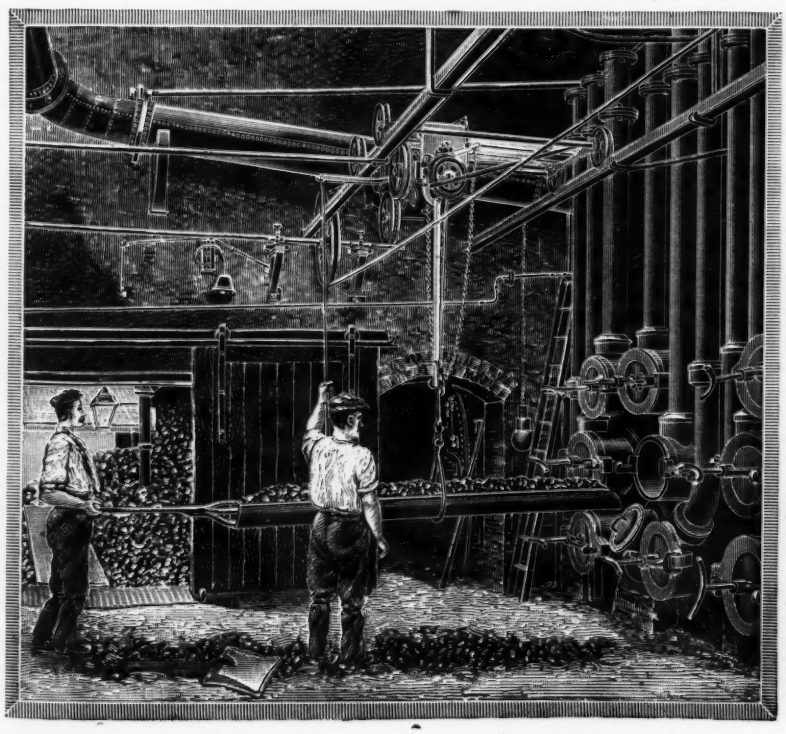

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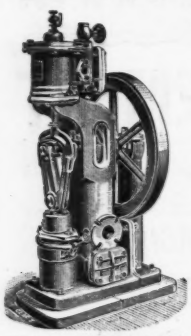

Fig. 705. "SINGLE RAM" STEAM-PUMP.

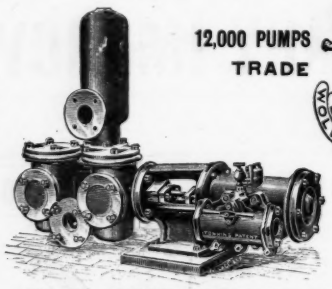

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

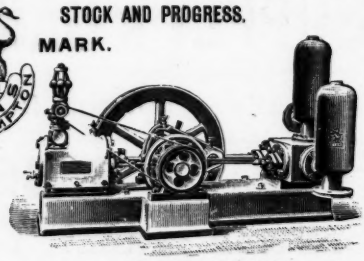

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

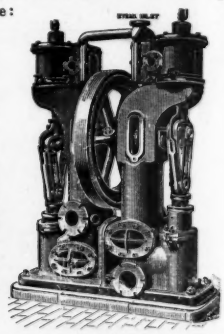

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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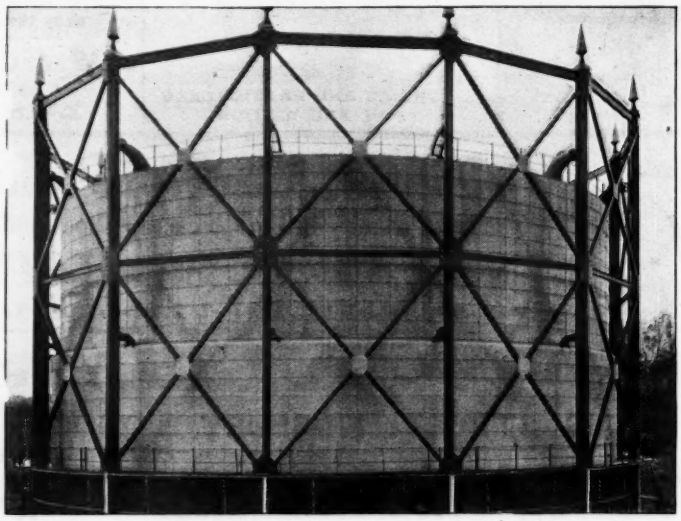

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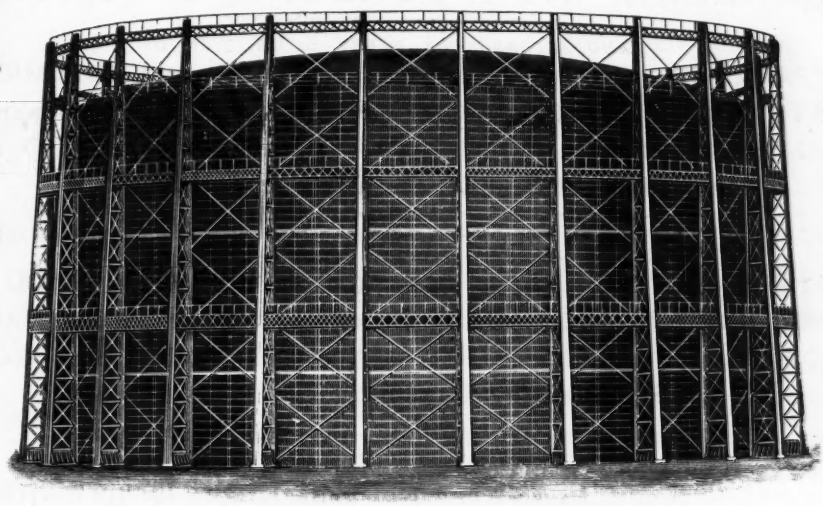

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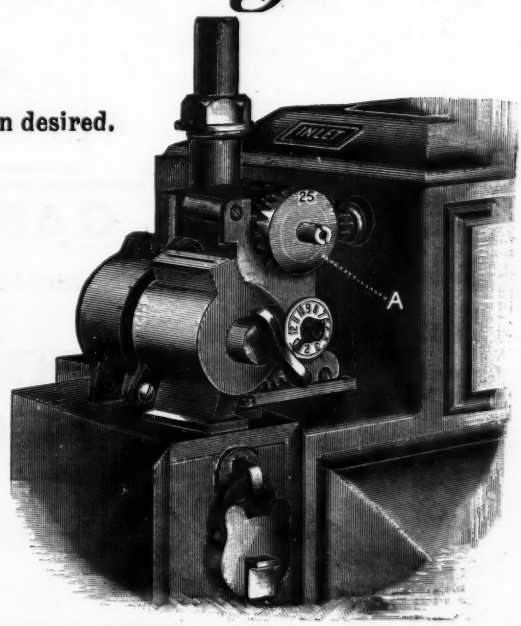

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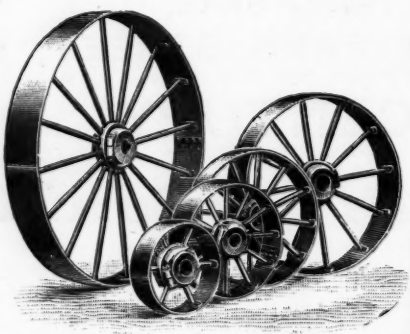

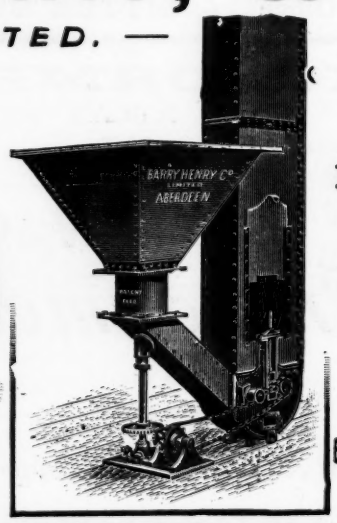

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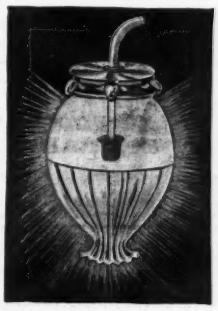

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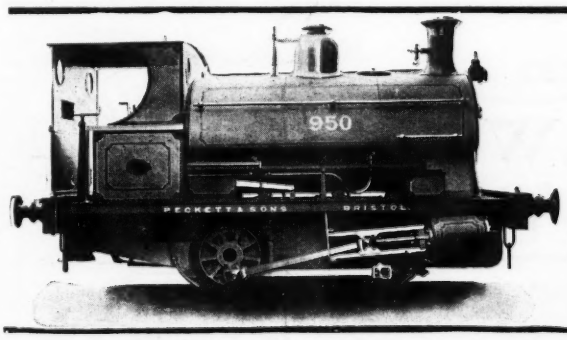

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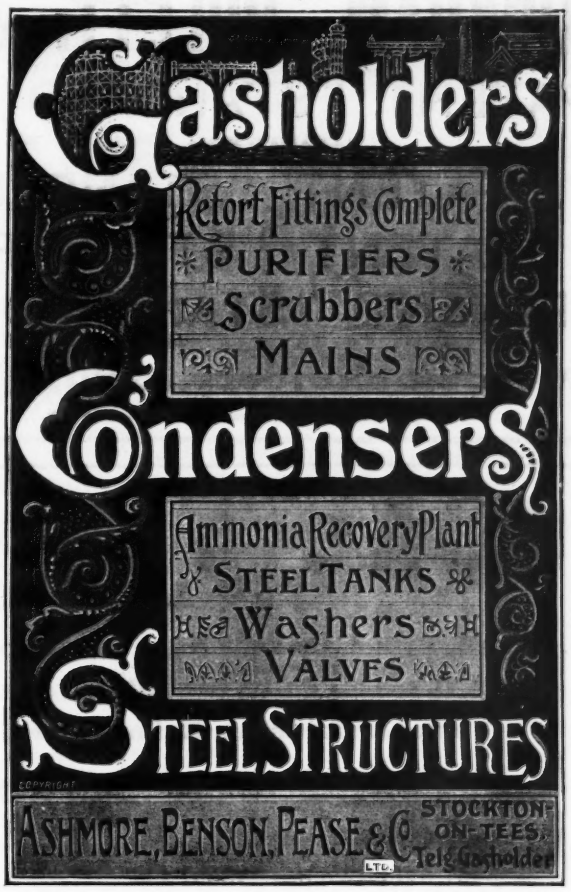

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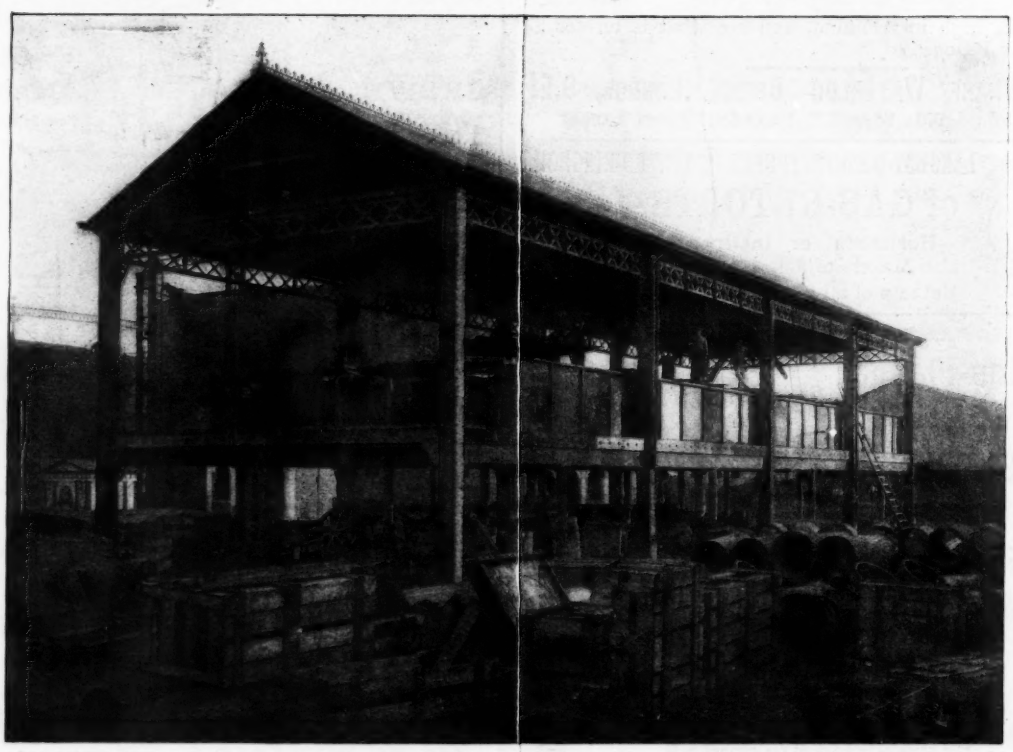

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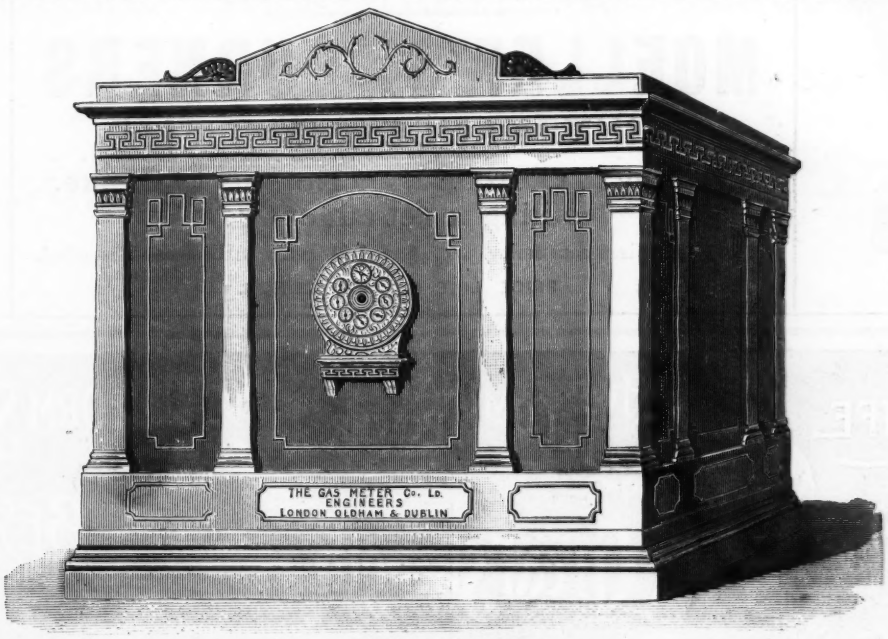

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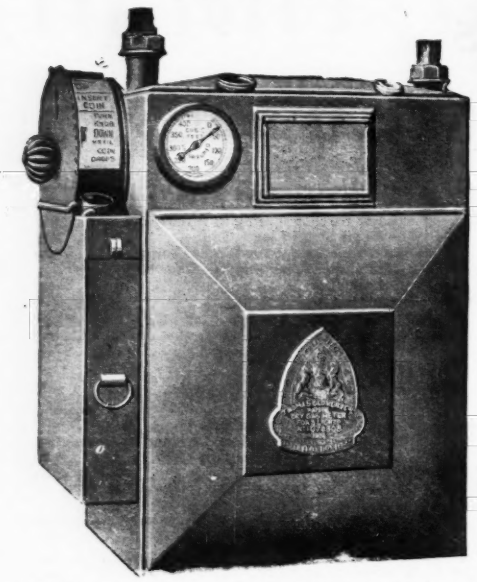

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1904.

A Retrospect.

THE year began with the fairest prospect of a continuance of peace throughout the world; but this soon became overclouded, and it was not very long before the clash of arms sounded in the Far East. The Japanese, to the surprise of most people and the admiration of all, have successfully asserted themselves against their adversaries the Russians both by land and sea; while the latter, by their dogged perseverance in face of defeat, and particularly by their heroic defence of Port Arthur, have earned for themselves admiration in a scarcely less degree. Humanity, however, shudders at the loss of life which this stupendous conflict has already entailed, and of which the end cannot as yet be foreseen. Whatever may be the ultimate result, one thing is certain—namely, that Japan must henceforth be reckoned a nation of the first importance. Equal in population to ourselves, with a thriving trade, and with aptitude for peaceful rule not less than for all the arts of war, the Japanese have carved out for themselves a first place among the nations of the earth. They have, moreover, set an example in the conduct of this war which puts to shame the occasional barbarity of her civilized and professedly Christian adversary. We may well feel proud of our ally—for such is Japan in a limited sense—and wish her success in a struggle which is to her one for national security and even existence. Nor is it easy to forget that Russia is fighting for the retention of ill-gotten gains; and but little sympathy will be felt for her if the whole of Manchuria be wrested from her grasp. At the same time, her not unnatural desire to obtain the advantage of a warm seaboard will always have to be reckoned with; and, as a mere matter of policy, it is questionable whether it would not be to the advantage of this country were she to continue to expend her resources in that far-off land. There is no need to adopt any alarmist view with regard to India; but that coveted possession is, as was recently pointed out, only separated by about 400 miles from Russian territory, at the boundary of which there is a double line of railway leading to the interior of the latter. Some estimate of the power and resources wielded by Russia may be formed from the extent to which these have made themselves felt at a distance of something like 6000 miles—only traversable by road or rail—from her base. How much more might they not have been felt, and how much more difficult would have been the task of the Japanese, had the line of railway over which all her troops and supplies have had to be conveyed been a double instead of a single one. Again, how much less formidable might not Russia's task have been had she been separated only by the distance which brings her into such close touch with our Indian Empire. The growing discontent of the Russian people with the war, and with their Government for withholding from them liberal institutions, is a significant feature of the time. So far, there has, fortunately, been no reason to anticipate the entanglement of this or any other country in the war, though the blunder—to call it nothing worse—of the Russian Baltic Fleet in the North Sea, by which some poor harmless British fishermen lost their lives, and a part of the Hull fishing fleet was destroyed, brought us to the verge of a conflict with Russia, in which, had war been the only alternative, this country must have had the moral support of the whole civilized world. Happily, the intense indignation which this outrage aroused was accompanied by a feeling of self-restraint against which the inflammatory utterances of a portion of the Press, and the rather sensational movements of our fleets, were powerless. Self-control is not less necessary for a nation than for an individual; and the readiness shown by the Government to submit their demands to the arbitrament of an impartial tribunal reflected the feeling of the country, which is that of confidence in the righteousness of its cause.

In matters more purely domestic, the year has been comparatively uneventful. A Government which has been described as "moribund" has continued to hold its own; and there is not any immediate prospect of a dissolution of Parliament. The Fiscal Question is still with us; but it is hardly regarded as being within the immediate range of practical politics, since those who raised it seem to be in no hurry to submit it to the country by means of a General Election. The feeling of unrest which it engendered is now much less marked than it was at the beginning of the year, and a growing confidence in financial circles is reflected in the substantial rise of nearly all kinds of securities which has taken place during the last two or three months. In gas securities, Gaslight and Coke ordinary stock has, for the first time for several years, touched par, which is a rise of about 14 points from the beginning of the year, and other gas stocks have similarly advanced; so that those who were able to invest in these securities only a few months ago have no reason to regret having done so. That the nation has begun to recuperate after the drainage of its resources to support the South African war, was indeed evident from the great success of the recent Japanese loan, which was subscribed for fourteen times over; though how much of this subscription was purely speculative, and not representative of money actually at command for investment, it is very difficult to say. This recuperation can, however, only proceed slowly, in the face not only of trade which, though improving, must still be described as indifferent, but also of additional Imperial taxation to the extent of some £30,000,000 per annum as compared with only a few years ago. How much of this extra expenditure is entailed by the necessity of maintaining an efficient service in all departments, and how much of it is waste of money, will probably never be known by the British taxpayer, who, apparently in utter desperation, pours out the vials of his wrath upon the municipal tax gatherer. It is curious to note the change which has taken place in this regard. Formerly the watchwords of at least one of the political parties of the State were "Peace, Retrenchment, and Reform." Economy of administration was, above all things, popular, and was, it must be admitted, occasionally pursued at the expense of efficiency. Now much of the attention formerly bestowed upon the national balance-sheets is transferred to municipal expenditure, as being, probably, more easily understood. Criticism is the undoubted privilege of British taxpayers—and it is desirable that this should be exercised to the fullest extent; but a due sense of proportion requires to be observed. The pounds of national expenditure weigh more heavily upon every individual than do the shillings of local rates, for which, moreover, there are generally some more or less tangible assets in the shape of gas, water, sewerage, tramway, electricity, or other works. That there has been imprudence and extravagance, no one can deny; but these surely are not past repair. What is wanted is a limitation of the objects for which public money may be expended, and a central authority to pass independent judgment on the schemes—sometimes but half-digested—of local authorities, and withal strong enough to say "No." This has special reference to electric light undertakings; many of these having been embarked upon to meet a demand which had but little reality, with the result that they do not pay. It has recently been ascertained that last year sixty-two of the municipal electricity supplies showed an aggregate deficit of £76,201. The subject of local taxation was very fully dealt with during the year in a series of articles in the financial supplement of "The Times." In the course of this, it was shown that, in the case of gas undertakings, the whole of the rates levied upon these are paid by the consumer, in the shape of an increased price for gas; so that, to the extent of this increase, he pays rates twice over. As a remedy for this inequality of taxation, the suggestion was made that rates should be apportioned among those ratepayers for whose benefit they are levied; it being pointed out that such matters as public baths or libraries are not required by public companies as such. Differential rating, however, is likely to prove a difficult problem to deal with satisfactorily. A somewhat less thorny question is that as to whether taxation of public companies should not be accompanied by

direct representation. The Local Government Act of 1894 took away the right which was previously enjoyed by commercial corporations, under the Poor Law Amendment Act of 1867, to nominate an individual to act as their recognized representative in parochial matters; and this right, it is suggested, should be restored. This would require fresh legislation, which, it is admitted, there is not much chance of obtaining in the present condition of public business. In the meantime, a practical remedy is within reach, in the nomination for election on the governing body of a representative or representatives of the companies interested. There are now many representatives of the gas industry (as recently noticed in our columns) who are most usefully serving on district or borough councils; and the list might with advantage be extended. It is, however, satisfactory to note that the continued dearness of money has checked the launching of new schemes by municipalities, who find it difficult to borrow money in the usual way for any purpose whatever. In this extremity, recourse is being had to receiving money on deposit or on loan for small amounts. The latter is a system which has been successfully employed by the Corporation of Birmingham for many years. It is hardly surprising that these innovations should excite hostility on the part of bankers, to whom the issuing of Corporation loans has usually been a source of profit. Their opposition, however, whatever may be the merits or demerits of these methods of raising money, may be classed with that of stockbrokers who are aggrieved at the offering of gas stock to consumers instead of its being sold by auction or tender to the general public.

The progress of the gas industry has been well maintained during the past year. A brilliant summer and autumn operated to check the increase of consumption which was noticeable in the first half of the year; but cold weather, and an almost unprecedented succession of fogs, must have since made full amends. As regards the Metropolitan Companies, a very gratifying feature is the return of the Gaslight and Coke Company to the increased consumption list. This is rightly regarded as a hopeful sign, after an interval of several years, during which the Company's business has steadily declined. It indicates that strenuous efforts are now being made to recover the ground lost by the inroads of electricity into their district. Some, however, of their former consumption has, by the displacement of buildings to make room for improvement, passed into the hands of Suburban Companies. This seems evident from the large increases which some of the latter continue to enjoy. It is very significant also, of the change which is taking place in what may be called the incidences of gas consumption, that these increases are greatest in the case of companies who serve a middle or working class population. Thus, the Tottenham and Edmonton, the Lea Bridge, and the Ilford Companies are increasing at the rate of from 12 to 21 per cent.; while more modest increases of under 6 per cent. are the lot of the Brentford and the South Suburban Companies. The price of coal has continued downwards—contracts for the current year showing reductions of from 6d. to 9d. as compared with last year's prices; while quite recently there has been a further slight weakening. Oil, on the other hand, has not only maintained last year's figures, but is now advancing in price. In other directions the prices of material have been mostly in favour of buyers, although, as the year closes, there is a stiffening in the price of iron. Residuals have not maintained their values. Sulphate of ammonia has, it is true, remained steady, and is now a rising market; but tar, until recently, has continued depressed, owing chiefly to the falling off in the demand for pitch, the market for which, however, has again rallied. The price of coke was very fairly maintained during the earlier half of the year, but has since had to give way to the inexorable logic of want of trade. On the whole, however, the year's trading, so far as is known of its results, has been very satisfactory, and reductions in the price of gas have been pretty general. The South Metropolitan Company reduced theirs to 2s. per 1000 cubic feet, which is a record for London.

The proceedings of Parliament were comparatively uneventful, although by no means devoid of interest. The Crystal Palace District Gas Company were unsuccessful in a second attempt to rid themselves of the restrictions as to sulphur impurities (other than sulphuretted hydrogen), and to obtain authority for a reduction of illuminating power; the clauses relating thereto being struck out of the Bill promoted by them for these objects. This was at the instance of the Board of Trade, owing to the appointment by the latter of a Committee to inquire into all matters relating to gas testing in the Metropolis. Thus emasculated, the Bill passed as an unopposed measure. Under its provisions, the name of the Company has been changed to that of the South Suburban Gas Company, and authority is given for the appointment of Workmen Directors, the issuing of stock to consumers, and other minor matters. Other changes of name have occurred during the year. The Colney Hatch Company are henceforth to be known as the Southgate and District Gas Company, and the Croydon Commercial Gas and Coke Company as the Croydon Gas Company. Further reductions of the illuminating power of gas to 14 candles were made in several instances, among them being those of Rotherham, Chesterfield, Blyth and Cowpen, Tynemouth, and South Shields. In the latter of these, the sulphur restrictions were also removed, and a reduction of 3d. made in the standard price. This, however, the Committee intimated was not to be regarded as a precedent, since certain additional facilities which had been given to the Company for carrying on their business were taken into account in fixing it. The illuminating power was also put at 14 candles for several undertakings applying for incorporation; so that the 15 candles fixed by the Model Bill may be regarded as practically obsolete. The prescribed methods of testing, as also the description of burner to be employed and the mode of using it, show considerable diversity in the various Acts of the session. In two instances, however, it is provided that the method of testing adopted for the Metropolitan Gas Companies shall be the prescribed method. A good deal of solicitude was shown by the Committees of both Houses on Unopposed Bills with regard to discounts to be allowed to consumers, and also as to the extra price chargeable for slot-meter consumption; while, for the first time, the depth at which gas-pipes are to be laid was prescribed by Act of Parliament. A modification of what is known as the Bermondsey Clause was made by the Duke of Northumberland's Committee, after hearing the representatives of the Board of Trade in opposition to the clause. This now provides that, at the expiration of every third financial year, local authorities being electrical undertakers shall reconsider, and, if necessary, revise, the scale of prices charged for electrical energy, so that, as far as practicable, no rate-in-aid will be required. Thus modified, the clause was incorporated in several Provisional Orders. Schemes for the distribution of electricity and power gas over large areas received a check in the rejection of the Cheshire Electricity and Power Gas Bill, by which it was sought to remedy the deletion of this county from the area granted in the North-Western Electricity and Power Gas Act of last year. Further powers were, however, given in regard to the latter, and authority was also conferred for the supply of electricity and power gas over a large area in the north-east of Ireland, comprising parts of the counties of Londonderry, Antrim, Down, and Armagh.

The legal proceedings during the year presented but few matters of general interest to the gas industry. In the case of the *Cannon Brewery Company, Limited v. The Gaslight and Coke Company*, the decision of the House of Lords was adverse to the latter, and upheld the immunity of the incoming tenant, under the conditions of this case, from liability for the unpaid gas account of a previous tenant. The Belfast Gas Committee were held to be answerable for nuisance arising from one of their retort-houses; the South Suburban Gas Company were fined for pollution of a stream adjoining their works, in regard to which an appeal is pending on a point of law; and the Ilford Gas Company unsuccessfully defended an action brought against them for damage done by flood water resulting, it was alleged, through their operations or default. The liabilities of slot consumers were made clear by proceedings instituted by the Gaslight and Coke Company and others; and the illegality of payment of income-tax on maximum dividends was declared by the judgment given in the case of *Attorney-General and Others v. Ashton Gas Company*. The decision of the High Court of Justice in the case of *Bellamy v. Liverpool United Gaslight Company* showed that obligation to supply gas under the provisions of the Gas-Works Clauses Act does not carry with it the right to trespass upon private property with that object. The Chepstow Gas Company were successful in the action against the Chepstow Electric Light Company for failing to give the necessary three days' notice

of their intention to open up trenches, and also for laying their mains in such close proximity to the gas-mains as to render the latter difficult of access. The Alliance and Dublin Consumers' Gas Company were upheld, by the decision of the Dublin Divisional Magistrate, in their resistance to the renewed demand of the Dublin County Council that their mains and services should be laid at a depth of not less than three feet. In the case of the former, the Magistrate decided that a depth of two feet was sufficient, and in that of the latter nine inches. This is, so far as is remembered, the first time that the depth at which service-pipes are to be laid has been decided in a Court of Law.

An event of the highest importance in its bearing upon the future of the gas supply of London, and indirectly upon that of gas supply generally, was the appointment by the Board of Trade of a Departmental Committee to inquire and report as to gas testing in the Metropolis. This was in pursuance of the agreement arrived at last year between the London County Council and the Metropolitan Gas Companies, by virtue of which the Bill promoted by the former was withdrawn, and that of the Commercial Company limited in its operation to a period of three years. The reference to this tribunal was commendably wide; while the composition of the Committee (on which Mr. William King, of Liverpool, represented the gas industry) was such as to inspire the fullest confidence in its impartiality. A great body of evidence was laid before the members on behalf both of the London County Council and the Gas Companies, and the result was, on the whole, fairly satisfactory to the latter. The recommendations which the Committee made in their report are emphatically in favour of the abolition of the existing restrictions with reference to sulphur impurities other than sulphuretted hydrogen, and of a more rational method of testing for the presence of the latter than that which has been imposed by the Gas Referees in accordance with their interpretation of the legislative enactments on the subject. They also provide for the substitution of the decision of the Chief Gas Examiner for that of a Police Magistrate in regard to penalties for default in illuminating power or purity, and for reference to the same authority in case of difference or dispute between the Gas Companies, or any one of them, and the Gas Referees. It is further recommended that additional tests be made and recorded of (1) the illuminating power of the gas when consumed in a flat-flame burner, and (2) its calorific value. No penalty is to attach to these additional testings, nor to the testings for any sulphur compounds other than sulphuretted hydrogen, which are to be continued, and recorded. The one really regrettable feature in the recommendations is the proposal to revert to the 5-feet rate of consumption when testing for illuminating power. This was met by a chorus of disapproval; and the Institution of Gas Engineers, at their annual meeting in June, unanimously protested against it. A memorial has since been drawn up on the subject by the Council of the Institution, and submitted to the Board of Trade. Both the London County Council and the Companies jointly have deposited Bills for the consideration of Parliament, dealing with the various recommendations. In addition, the South Metropolitan Company are promoting a separate Bill, which provides for the total abolition of the Gas Referees.

Unsuccessful, as mentioned above, in their second application to Parliament for relief from their statutory obligations in regard to sulphur impurities and illuminating power, the Crystal Palace District (now the South Suburban) Company took an unusually bold and original course. The fulfilment of these obligations had brought them into conflict with the Lewisham Borough Council, by whom they had been prosecuted for creating a nuisance in the neighbourhood of the works, caused by foul lime; and likewise for polluting with tarry matter the stream adjoining their works. They now resolved to cut the knot of their difficulties by abandoning at once the use of lime and carburetted water gas. The letter in which this was announced to the consumers pointed out that the effect would be the presence in the gas of the sulphur compounds other than sulphuretted hydrogen, and a reduction of illuminating power of about 1 candle—these changes, however, being accompanied by a reduction of 1d. per 1000 cubic feet. It was a weighty indictment of the restrictions under which the Company had been labouring; and also of carburetted water gas, the drawbacks to the use of which were candidly admitted. The latter aroused a good deal of feeling among the advocates of carburetted water gas, some of whom displayed considerable acrimony in their references to it. But the indictment was not disposed of; and the inquiry made in these columns as to what financial advantages have accrued to gas undertakings by their adoption of this gas remains unanswered. The consumers of the Company, there is every reason to believe, are quite satisfied with the change—only one letter expressing an adverse opinion having been received. The Lewisham Borough Council, however, on finding the Company's gas deficient in illuminating power, and also containing an excess of sulphur, issued summonses on both counts. On the hearing of these, the position of the Company was fully explained by Mr. Horace Avory, K.C., who appeared for them; and in the result they were fined 40s. on each summons, with a small amount for costs in addition. The Company are now promoting a Bill the principal object of which is to legalize the alterations made in the illuminating power of the gas and the extent of its purity.

In gas engineering, the notable event of the year has been the formal opening of the new Provan works of the Glasgow Corporation. These fine works were, as our readers are aware, designed and partly constructed by William Foulis, whose death it was our melancholy duty to record last year, They are, by common consent, regarded as a monument to the skill and ability of the designer, whose ideas have been faithfully carried out by his able successor—Mr. Alexander Wilson. Considerable progress has been made with the gigantic works at Long Island, for the Consolidated Gas Company, of New York City, under the direction of Mr. W. H. Bradley, who has in contemplation the construction of a gasholder exceeding in size the largest one at East Greenwich. But, if rumour speaks truly, this is not likely to enjoy for long the reputation of being the largest in the world; the South Metropolitan Company being credited with the intention of erecting, at no distant date, a gasholder greatly exceeding in size anything that has as yet been attempted. The system of inclined retorts made but little headway during the year—there appears to have been, in fact, a revulsion of feeling in favour of horizontal retorts, which it is perfectly clear are by no means played out, especially when conjoined to some one or other of the very effective systems of stoking machinery which are now available. The De Brouwer coal projector and discharging-ram have been successfully installed in several English works; and a highly successful discharging-ram, actuated by hydraulic power, is in operation at the Rotherhithe works of the South Metropolitan Gas Company. This is the invention of Mr. Hunter, the Engineer in charge of these works. The idea of pushing the coke out at one end of the retort, instead of drawing one half of it out at each end, seems to have occurred to several inventors almost simultaneously, and has sprung into favour, owing to its manifest convenience. It has proved, moreover, to be quite practicable with the retorts in a proper state of repair. Where they are not kept so, trouble is likely to result from almost any system of charging or discharging. Vertical retorts have not yet emerged from the experimental stage, although the latest results obtained with them, both in this country and on the Continent, are encouraging. Gas compression as an aid to distribution has been further developed in America, where, however, there seems to be some danger of its being overdone. The scheme for St. Louis, for example (a description of which appeared in our issue of the 19th of July) is not likely to be extensively imitated.

The solution of the naphthalene problem has been advanced a step by the successes achieved by Mr. J. Ferguson Bell at Derby and elsewhere, and by Mr. Alfred Colson at Leicester, by means of oil-washing processes. These have tended to confirm the belief that there exists in coal tar a sufficiency of solvents for naphthalene which require to be brought into intimate contact with the gas, and justify the conclusion which had been arrived at on the subject by the Committee of the Southern District Association, who have had the assistance of Dr. H. G. Colman in dealing with this question. Oil-washing, however, as an addition to the ordinary operations of a gas-works, may be tolerated for the relief which it ensures, but cannot, in the opinion of many, be regarded as a final and satisfactory disposal of the matter. Moreover, it throws no light upon the question as to why naphthalene should be abundant in some works and entirely absent in others. This the Southern District Association have set themselves to answer, if possible; and they have therefore very properly appealed for further funds to enable

them to continue their researches. It is greatly to be hoped that to this appeal there will be a liberal response.

An exhibition was held at St. Louis on a larger scale than has ever been attempted before, to celebrate the centenary of the Louisiana purchase by the United States. This was intended to be international, inasmuch as the co-operation of all foreign countries was invited; and a Royal Commission, of which Sir George Livesey is a member, was appointed by the King to represent this country. Owing, however, chiefly to the American tariff, which effectually protects most American manufactures against those of other countries, British industries were only partially represented; there being but little inducement for manufacturers in this country to incur the expense of exhibiting without the prospect of any trade in return for it. Those, however, who did exhibit had no reason to complain of their reception, for a large number of medals and certificates were awarded to them; among the recipients being the Gaslight and Coke and South Metropolitan Companies, for excellent collections of gas-works bye-products. It is very gratifying also to know that British Art obtained a very high place in this international collection. Advantage was taken of the exhibition to organize visits to America, representing the various scientific and technical institutions of this country; among these being the Institution of Civil Engineers, the Iron and Steel Institute, and the Society of Chemical Industry. These visits were made thoroughly enjoyable by the most careful organization and lavish hospitality on the part of our kinsmen in America and Canada, and will long be remembered by those who were able to take part in them. The attendance at the exhibition was, it may be mentioned, much less than was anticipated. It amounted to about 14 millions, or only one-half of that at the Chicago exhibition a few years previously.

If it be permissible to mention in terms of comparison, another exhibition of a far less pretentious character, which was held a great deal nearer home, it may be stated that the gas exhibition at Earl's Court was, in its way, a greater success than was this much-vaunted exhibition at St. Louis. This was held so recently as to be fresh in the minds of everyone, and its lessons are not likely to be soon forgotten. The idea of holding such an exhibition had been mooted last year, and arrangements actually made for it to be held at the Crystal Palace. These, however, fell through, so far as the Institution of Gas Engineers is concerned, through want of time for the necessary preparations. Nevertheless, an exhibition was held by the Crystal Palace authorities, although supported by only a few exhibitors. The inadequate show thus offered to the public made it all the more necessary for the Institution to carry out their idea of a truly representative exhibition; and, accordingly, arrangements were made for holding one at Earl's Court, which was felt to be, on the whole, more desirable than the Crystal Palace. From the outset, the financial responsibility and organization were entrusted to Messrs. Bridges and Smith, who had had previous experience with similar exhibitions; and an Advisory Committee was nominated by the Council of the Institution of Gas Engineers, to superintend and, as the name implies, advise the Organizing Managers in all matters relating to the exhibition. This Committee selected Mr. James W. Helps as their Chairman. An influential General Committee was also formed, of which Mr. H. E. Jones was the Chairman. An appeal was made to gas undertakings for funds for the purpose of defraying certain expenses which did not devolve upon the Organizing Managers, and the appeal was liberally responded to. An Exhibitors' Committee was also subsequently appointed, with Mr. Charles Clare, of Messrs. Fletcher, Russell, and Co., Limited, as Chairman. The arrangements made gave general satisfaction, and secured the utmost harmony of working. The whole of the available space at Earl's Court was soon applied for, and more could have been made use of. The exhibition was formally opened on Saturday, the 19th of November, by the Lord Mayor and Sheriffs, who were afterwards entertained at a banquet which was presided over by Mr. H. E. Jones, who was supported by Mr. D. Irving, the President of the Institution of Gas Engineers. Among the guests were the Lord Mayor of York, the Mayors of several of the Metropolitan Boroughs, and the acting Consul-General for Italy, together with a large number of the exhibitors. It was a happy send-off for the exhibition, which from first to last proved a great success; the attendance of the general public far exceeding the most sanguine expectations. This was largely due to the extensive use of free tickets issued by various gas undertakings; but not an insignificant proportion of the visitors paid for admission. The Press notices were all of a favourable character, and in some the exhibition was described as one of the sights of London, as it really was. While fully representative of the various uses to which gas is applied —namely, heating, cooking, and motive power—perhaps the feature that attracted most attention was the wonderful display of incandescent burners for both indoor and outdoor lighting, from those of very high power, worked with compression or self-intensified, to the small bijou inverted burner consuming only 1 cubic foot per hour and upwards. It was a surprise and a revelation to many; and if the exhibition had served no other useful purpose, it was worth holding on that account alone. Its use was, however, by no means confined to this. It proved to be an object-lesson in all the various applications of gas, and in the methods of its manufacture, of which, it is satisfactory to know, a very great many availed themselves. Visitors came to the exhibition from far and near; several gas undertakings sent many of their employees in large numbers (notably the Birmingham Corporation) at their expense; the various District Associations held their autumnal meetings at Earl's Court in order to give their members a full opportunity of seeing the exhibition; and an International meeting was held on the 6th of December, at which there were present representatives of five Continental Gas Associations, including the Presidents of four of these—namely, the French, German, Belgian, and Dutch Associations. The visitors were entertained at luncheon by the President of the Institution of Gas Engineers (Mr. D. Irving) and Mr. H. E. Jones and Mr. J. W. Helps as Chairmen of the Exhibition and Advisory Committees, and they were afterwards conducted round the exhibition. In the evening they were entertained at a banquet at the Hotel Cecil, presided over by Mr. Irving, and separated well pleased with their reception, and with all they had seen. In all respects this exhibition was a very memorable one, and reflected the highest credit upon all concerned. It is very gratifying to know that those who may be said to have been principally concerned—namely, the exhibitors—all expressed themselves as having been quite satisfied, not only with the arrangements made for them, but also with the results of their ventures. That the exhibition cannot fail to bring solid advantage to every branch of the gas industry, is the opinion of all. It may not have brought to light many new or striking departures from accepted practice in regard either to the application or the manufacture of gas; but it served a most useful purpose by marking, in a manner not to be mistaken by the public, the wonderful development in these respects which has occurred since the last great exhibition of the kind, which was held at the Crystal Palace in 1882-3, and as having shown to the world the immense superiority of gas over electric or any other source of lighting.

There is not a great deal to be said with regard to the gatherings of the Technical Associations connected with gas during the past year. The Institution of Gas Engineers held a very successful annual meeting under the presidency of Mr. H. E. Jones, when some useful papers were read and discussed. The terms on which District Associations might become affiliated with the Institution were agreed upon during the year; and the necessary alterations in the Articles of Association were submitted to, and passed by, special general meetings held for the purpose at Earl's Court during the continuance of the Gas Exhibition. The chief work, however, of the Institution may be fairly stated as the inauguration of the latter, by which they did splendid service to the gas industry, and proved at the same time the great value of its representation by a united body. The various meetings of the District Associations fairly maintained their character for usefulness. There was a further development of the movement for the formation of Junior Associations, which are doing much valuable work.

The labour question, as affecting the gas industry, has been practically quiescent, though trouble has been experienced in Italy, where, however, the socialistic movement received a check at the last elections. The co-partnership scheme adopted by the South Metropolitan and other Companies continues to give satisfaction to employers and employees alike, and still stands out as the best remedy ever tried for want of sympathy and concert between capital and labour. It is regrettable, therefore, that there have been no

fresh adherents to this system during the past year; and that, on the other hand, as regards industries generally, the premium bonus system, after having for some years given complete satisfaction to the Amalgamated Society of Engineers, has been denounced by the Engineering and Shipbuilding Trades Federation, which is a much larger Trade Union, and includes all trades connected with engineering and shipbuilding. This denunciation has the appearance of opposition to any differentiation of the rewards of labour, and of aiming at equal time-wages for all workmen alike; and it may have the effect of opening up the whole wages question in connection with the trades affected. Recent decisions of the Law Courts which pronounced picketing to be illegal, and the funds of Trade Unions to be liable for the acts of their members or executives, alarmed the Trade Unionists, who have agitated for an alteration of the law in these respects. Bills with this object in view were introduced into Parliament during last session; but the whole question was referred to a Royal Commission, who have had several sittings and heard a considerable amount of evidence, the general tendency of which is to the effect that, since the decisions above referred to, by which the Trade Unions have been brought to know and realize their legal responsibilities, disputes have been more reasonably conducted, and settlements of them made easier than formerly. What is really required is not an alteration of the law in favour of trade combinations, so as to place them above ordinary or common law, but wholesome respect on their part for the law as it now stands, and a continuance of the reasonable conduct which this engenders.

A distastrous gas explosion in a purifying-house at the Saltley Gas-Works of the Birmingham Corporation has to be chronicled. This occurred very early on the morning of the 10th of October. Three men were unfortunately killed by it, and two others seriously injured; while the building (some 300 feet in length) was completely wrecked, and many of the purifiers which it contained greatly damaged. It was the most serious explosion of the kind which has occurred since the one at the Nine Elms Gas-Works in 1865; though fortunately attended with less fatal results than on that occasion, when ten men lost their lives. Gas seems to have been escaping from the lute of one of the purifiers when the foreman in charge, accompanied by four other men, went into the house for the purpose of altering certain valves in order to reduce the pressure within the purifier. After making the alteration, though apparently without much effect, the men were leaving the house—Jordan, the foreman, carrying a safety lamp—when the explosion occurred. At the inquest, which had to be adjourned for a month to enable the two injured men to give evidence, considerable attention was turned on the construction of the safety lamp, which was thought to be the cause of ignition, there being no naked flames in the immediate neighbourhood; but no light was thrown upon the cause of escape from the purifier. A verdict of "Accidental death" was returned, without any comment from the Jury. Much sympathy was expressed with Mr. Hack and the Birmingham Gas Committee at this most regrettable occurrence. Other minor gas explosions occurred more recently. Among them was one at the Mill Hill (Hendon) works, belonging to the North Middlesex Gas Company, by which a meter and governor house was destroyed, but fortunately no one injured; and one on the premises of a consumer at the corner of Southampton Row and Cosmo Place, while an alteration of the service was being effected by the staff of the Gaslight and Coke Company, some of whom were overcome by the escaping gas. Injury was occasioned to a number of persons, and considerable damage to property. Several cases of gas poisoning were recorded through gas-jets having been left turned on without being ignited. A serious one occurred at Brighton, by which an aged couple—visitors to this seaside resort—lost their lives. These, it appears, made five deaths from gas poisoning since the introduction of carburetted water gas by the Company; and at the inquest the Medical Officer of Health commented upon the proportion of this gas sent out by the Company. In connection with this, it may be mentioned that a deputation from Liverpool recently waited upon the President of the Board of Trade, to urge upon him the desirability of introducing a Bill with the object of limiting the quantity of carbon monoxide in the gas as supplied to consumers.

Reviewing the personal changes of the year, the list of those who have held place in the official life of the gas industry, and who during the year have retired to enjoy repose well earned, is a long one, and includes several who have left behind them a story of brilliant work and of honest industry. Mr. George Careless Trewby finally withdrew from the Chief Engineership of the Gaslight and Coke Company; and Mr. William King's secession from office ended a remarkable family connection with the Liverpool United Gas Company. Another loss suffered by the latter Company was the resignation about the same time of the Chairman, Sir Edward Lawrence. Mr. John Booth ended a long connection with the Southport Corporation Gas-Works; while Mr. Robert King bid farewell to those with whom he had worked for a considerable number of years as Chief Gas Engineer of the Southern Division of the London and North-Western Railway. Mr. James Lowe, of Weymouth, Mr. J. H. Cornish, of Bridgwater, and Mr. Thomas Webb, of Staines, handed over the reins to younger men after their many years' activity. Mr. H. P. Maybury dropped out of the gas engineering world to take up the (to an active, aspiring man) more tempting duties of Surveyor to the Kent County Council. In the secretarial department, through retirement, names that have had prominent and considerable association with the gas industry have been replaced by others—notable among them being Mr. C. Crowther Smith, of Southampton, Mr. James Pye, of Chester, and Mr. F. W. Himing, of the Continental Union Gas Company. Naturally, so many retirements, together with a few removals by death, have brought several promotions and changes from old to new spheres of action. We cannot mention all. But among the more conspicuous appointments of the year were Mr. T. Goulden to succeed Mr. Trewby, and Mr. Edward Allen to follow Mr. William King; while Mr. John Bond went from Leeds to Southport, Mr. William Newbigging took over the gas and water engineerships to the Macclesfield Corporation (on the death of his youngest brother), Mr. Douglas F. Colson betook himself from parental supervision to the responsibilities of chief at Weymouth, and Mr. H. C. Head vacated the assistant engineership at Bournemouth to take up the work laid down by Mr. Dexter at Winchester. The reorganization of the Gas Department at Glasgow, following the appointment of Mr. Alexander Wilson to succeed Mr. Foulis, brought about several changes—among them the selection of Mr. James Lowe as Assistant General Manager. Looking abroad, perhaps the most important appointment was that of Mr. Bernhard Ernst Körting to the Chief Engineership of the Berlin works of the Imperial Continental Gas Association. While referring to these personal matters, we cannot refrain from the remark that the illness, during the latter months of the year, of Sir George Livesey caused in the gas industry universal and intense regret; and there was widespread sympathy with both him and Lady Livesey. His recovery and return to activity brought quite a feeling of relief.

With thankfulness, it is found that the hand of the Reaper passed lighter than in some former years over the ranks of the British gas profession. Those who have died in active service are few. With the greatest number of years to his credit was Mr. E. H. Waterford, the Engineer of the Alliance and Dublin Consumers' Gas Company. The death by poisoning following a cycle accident of Mr. Ernest L. Newbigging, of Macclesfield, closed a promising career, and brought poignant grief to a much honoured father. The suicide of Mr. F. D. Dexter caused a painful sensation in professional circles. The year closed the lives of several who had resigned office, but had given many years of their careers in the service of the industry—chief among them being Alderman Annan, Mr. Thomas Walker, Mr. J. Ohren Ovington, Mr. George T. Myers, and Mr. Peter Watson. A notable figure was taken away in Dr. Alexander W. Williamson, who for many years held the position of Chief Gas Examiner for the Metropolis. To the great sorrow of all who worked with him, Mr. Arthur H. Cane passed from the service, as Secretary, of the Reading Gas Company; and an interesting and useful figure was removed from our midst by the death of Mr. H. A. Willey. Looking abroad, a career of much brilliance and devoted service ceased with the death of Mr. Edward Drory, the Chief Engineer of the Berlin works of the Imperial Continental Gas Association. Herr Emil Merz, of Cassel, who was held in high esteem as an authority on modern gas-works construction, was prematurely called from his labours; and, after some years of retirement, M. Alex. Arson, who for 37 years was Chief Engineer to the Paris Gas Company, also joined the

majority. From their places in the world of science, passed compatriots in the persons of Herr Frederich Siemens and Herr von Hefner Alteneck. Gaps were left in the American gas industry by the deaths of General Hickenlooper, Mr. A. B. Slater, and Captain W. H. White.

The pages of the history of the gas industry during the year now closing are marked with regrets and disappointments; but they are comparatively few. The industry has added to its strength; and hopes have been still further fortified. On the whole, we look over the year, viewed from the standpoint of the industry, with considerable pleasure. The horizon is unclouded; and we go forward with buoyant spirits into the New Year to meet the work which lies before us, and which work includes the further emancipation of the industry. To one and all of our readers we wish, with the utmost heartiness,

A Bright and Prosperous Year.

The Publication of Accounts by Continental Gas Companies.

The appeal made by the proprietors of the Continental Union Gas Company for the circulation of their annual accounts, it will have been seen from the report published last week, has been yielded to by the Board of Directors; and henceforth the accounts will be published. The subject has been raised on several occasions; but hitherto it has been considered impolitic to comply with the request, though the accounts have always been open to the examination of the proprietors at the office. The question has been asked as to what effect the statement of the Chairman (Mr. Arthur Lucas) at the meeting of proprietors will have in the case of other English Gas Companies whose business is centred in Continental countries. He said: "The reasons against the publication of the accounts that obtained many years ago in these foreign gas companies did not obtain now; and therefore he thought that it was their duty, as the Directors were always anxious the proprietors should have full information, to give them, as they hoped to do in future, an early statement with regard to the accounts, together with the report." It is pointed out that a majority of the Board of the Continental Union Gas Company, who are evidently in agreement with the Chairman's declaration, are members of the Boards of other English Gas Companies doing business on the Continent. In addition to the Chairman, there are Mr. N. E. B. Garey, Mr. R. Hesketh Jones, and Mr. J. H. Birchenough.

The Monazite Sand Concession and Thorium.

In reply to an inquiry on this subject addressed to the Commercial Department of the Board of Trade, we have received the following communication from the Principal, Mr. Thomas Worthington:—

> With reference to your letter of the 15th inst., relating to monazite sand concessions, inquiries were made of His Majesty's representative in Brazil, who states, in his reply, received by cable to-day [Dec. 20], that the concessionaire still holds all his monazite sand concessions. The option which the American Welsbach Company had to purchase them lapsed some months ago. The concessionaire is still at liberty therefore to consider any other offer which he may receive for the concession of his rights. In connection with the observation made in your letter of the 15th inst., that the contract for monazite sand had been made for another twelve months, I may point out to you that the concession held by the present concessionaire is reported in "The Brazilian Mining Review," July, 1903, as for a period of thirty years.

With reference to our comments last week on the question of the anticipated further rise in the price of thorium, and to the statement that contracts appear to have been made well ahead for the ensuing year at current prices, confirmation to this effect has been received from certain mantle makers. It seems, therefore, that, whatever the nominal price of thorium may be in the coming year, the price of mantles should not in any way be adversely affected from the point of view of the consumers.

"Refuse" Mantles or "Seconds."

While we have every desire to support home industries, a sense of fairness dictates a few remarks on the question of what are known in the incandescent trade as mantle "seconds," upon which the utmost obloquy has been cast by the application to them of the term "refuse," to which term people are prone to give its broadest meaning. We have a strong objection to "seconds" when they are sold, as they are sold by many nefarious vendors in this country, as unblemished articles; but the same objection does not hold good when they are sold as "seconds," and at a cheap rate. In the course of a leaderette in last week's issue on the subject of "Monazite Sand and Thorium," we published a paragraph which had been derived from a German gas paper, but of which we have not yet discovered the original. At the end of the paragraph, this statement was made: "The German mantle manufacturers alone ship some 70 millions of mantles to England, who is a buyer of all refuse goods—of course, at exceedingly low prices." This paragraph has since found its way into a number of daily provincial papers; and it has, of course, given offence in those quarters in which every effort is made to conduct business on honest lines. We disputed last week the assertion that 70 million mantles are shipped to this country by German manufacturers, and placed the figure at nearer 25 millions. The conjunction with the 70 millions of the statement as to the "refuse goods" will give the uninitiated into the mysteries of the mantle trade the idea that the whole of these millions of mantles are of that category. Conscientiously, we cannot allow such an idea to gain ground among readers, nor subscribe to the insinuation that the mental balance of the public of England is so affected that they prefer, and continue year after year, to pay the price of mantles perfect in form and sound in texture for those that are not so in either one or both respects. What are these "seconds?" In Germany, the manufacturers have a system of sorting out their mantles; and all that are misshapen or imperfect in other ways—such as in the length, or through the dropping of stitches in the knitting—are put on one side and yclept "seconds." Thus it follows that, save for their deformation or other damage, so far as quality goes, they are the same as the more perfect article. The same amount of labour has been expended on them; the fabric and chemicals are the same; and therefore the manufacturer (these "seconds" average anything between 5 and 10 per cent. on his production) cannot be expected to throw away entirely the expense involved in making them. But how is he to ensure that, after placing them in boxes duly labelled "seconds," no improper use is made of them by their being palmed off on the public, by some crafty dealer, as undamaged goods? Before we deal with the question, let us say this, that there are as many Englishmen as foreigners who indulge in this deceptive business. They go to Germany and scour the country for these "seconds;" and then bring them here. In most instances, the mantles then go out to the public in cases covered with labels other than those (or the stamping) originally exposed to view. Judging from experience in one firm, it is doubted whether, all told, more than a million of these "seconds" reach the English market. Of course, there are, in addition, mantles of common make; but it is not with these we are dealing here.

The Duty and Interest of Mantle Manufacturers.

It should be apparent to those manufacturers abroad who have these "seconds" to dispose of, that it is to their interest to take every precaution to see that they cannot be sold in any false character—for this, if for no other, reason that this trade must detrimentally affect the business in their own higher classed productions. We hate to see ill-shaped or other defective mantles, though there are many situations where, if "seconds" could be obtained cheaply, they might be usefully employed. We may give, as an illustration of how these "seconds" prejudicially affect high-class trade when they fall into the hands of unscrupulous vendors, some facts which came to our knowledge a short time back in connection with a certain well-known make of mantle. The "seconds" produced at the factory were sold in boxes properly labelled to indicate the nature of the contents; but the ultimate destination of these defective mantles was not known, and at one time nobody cared to inquire. But after a while the manufacturers found that, in certain northern cities of this country, a trade for which they could not at first account was being done in mantles bearing their own trade name. Further investigation, however, revealed the fraud that was being practised on the public. Dealers from this side bought the "seconds," and relabelled the boxes with the name by which the firm's mantles were known. What were the firm to do? They could not deny that these were mantles made by them, and that they themselves would have called them by their own trade name if they had not

been affected in some small way. But they at once recognized that it was against their interests and reputation that the traffic should be allowed to continue. They could not afford to destroy these "seconds;" and so they took the only alternative, and determined to keep the business in them in their own hands. Now they only sell them to firms who undertake to dispose of them as "seconds," and in no other way. As a still further obstacle to dishonest practices, the mantles all have an irregular red stripe painted down them, and are put in special boxes on which is printed conspicuously "Seconds." If other manufacturers would take similar preventive measures, a big reproach would be lifted from the mantle trade—to the benefit of manufacturers and the public; and then, with honesty in the traffic in "seconds," the opprobrium contained in the word "refuse" would be removed.

The Condition of the Iron and Steel Trade.

As is always the case, the review of the iron and steel trade which is annually issued by Messrs. Bolling and Lowe contains on the present occasion some interesting information regarding the condition and prospects of the iron and steel industries. The firm commence by pointing out that their prophecy of twelve months ago, that the immediate future could not be contemplated with confidence, has been borne out; the condition of the trades during 1904 having been unsatisfactory. Exports from this country, in comparison with the previous year (which itself was not a good one), show a falling off; the decrease for the first eight months having been equal to no less than 12½ per cent. Bad as this is, however, matters have been still worse abroad; the German decline for the same period having been 28 per cent. Belgium, on the other hand, shows a loss of only 3½ per cent. It is stated that our production of pig iron this year will probably reach 8,000,000 tons, of which 800,000 tons will have been exported. A considerable falling off has been experienced in the exports of rails from the leading producing countries; while the German Steel Association helped to stimulate American competition, and brought down prices to a very low figure. Messrs. Bolling and Lowe remark that the chief feature of the year has been the agreement between the makers of Great Britain, Germany, Belgium, and France to pool the export orders for rails. The agreement is based upon export sales averaging 1,300,000 tons a year; and the allotment to each country, taking the figure 100 as the unit, is as follows: England 53·5 per cent., Germany 28·83 per cent., and Belgium 17·67 per cent. The French works, whose export is very small, have their allotment added to this figure of 100, making the actual first year's unit 104·8, and the third year's 106·4. Our production of rails for 1904 has been about 750,000 tons, of which roughly 510,000 tons were exported. Particular interest at the present juncture attaches to the statement that the rail-mills lately started in Canada may, under their new tariff of $7 per ton, partially stop importation from America, which hitherto has benefited by large contracts for that market; and consequently the competition of the United States Steel Trust will in time be more keen in other markets. Messrs. Bolling and Lowe give it as their opinion that, upon the termination of the war in the East, the iron and steel trades will undoubtedly benefit, and that we may expect a fair proportion of the orders which the two countries engaged will have to give out. It is to be hoped that this forecast may prove to be as accurate as have others previously made by them. What the export trade means to this country will be gathered when it is stated that the value of the exports of iron and steel for the eleven months ended Nov. 30 in the past three years have been as follows: 1904, £25,911,557; 1903, £28,573,405; and 1902, £26,556,180.

The Tar Market in Ireland.—A meeting of the Committee of the Northern District of Ireland Gas Managers' Association was held in Belfast on the 21st inst., to consider the advisability of taking steps to counteract the serious reduction now taking place in the price of tar. After discussion, it was agreed that an extraordinary meeting of the Association be held at an early date, when particulars would be laid before the members, and (if necessary) some combined action agreed upon. Before fixing the date of the meeting, the Secretary and Treasurer (Mr. James Brodie, of Omagh) would be glad if any gentlemen intending joining the Association, and who have not yet done so, would kindly send him their names at once, in order that a fully representative gathering may be held.

WATER AFFAIRS.

The Principal Events of the Year.

The chronicler of the most noteworthy events of the year which is now closing will not have cause to complain of the superabundance of topics demanding his attention, inasmuch as, with a few exceptions which may almost be counted upon the fingers of one hand, the general progress of water affairs during the twelve months has not been marked by anything beyond its characteristic steadiness. Yet the exceptions referred to are of sufficient importance to make the year 1904 a memorable one in the history of the water supply of the country, and more particularly of the Metropolis. Compared with its predecessor, it has been, on the whole, a dry year; and during a long period of drought the effect was seriously felt in various parts of the kingdom. Happily there was no falling off in the supply of water in the Metropolis; but Manchester had to submit to a curtailment from the 25th of September till the 13th of November—the water being shut off for ten or eleven hours out of the twenty-four. At Tynemouth, the supply was reduced to a mere trickle; and the reservoirs at North Shields were practically empty. At Leicester, they actually showed a deficiency of 800 million gallons. Up to about the middle of November, the absence of rain was general over all the eastern half of Great Britain. The only western district, however, to which this remark was applicable was that lying to the north, where the shortage amounted to 2·4 inches. In the east and north-east of England and the east of Scotland, the deficit was about an inch greater; whereas in the Midlands it was the same as in the north-west. In this district last year, there was, in the period under consideration, an excess of 10 inches over the average quantity. Fortunately, however, as frequently happens, when things came to the worst they mended. Rain fell for about 76 hours in succession in South Lancashire; while in the southern portion of Scotland it was exceptionally heavy. In other parts of the country also welcome relief came, and the reservoirs were duly replenished. It must be acknowledged that the closing weeks of the year have done a great deal towards compensating for the previous absence of rain, for at times it has fallen in abundance.

Passing now to more specific topics, the changed condition of the water supply of the Metropolis is the first to claim attention. As the outcome of many years of persistent agitation, and of the determination of the Government that the time of Parliament should not be occupied any longer with discussions of the London Water Question, legislative sanction was given to the constitution of a representative body to acquire the undertakings of the Water Companies, and manage them on behalf of the public. After protracted arbitration and legal proceedings, the details of which have been fully recorded in our columns, the undertakings passed quietly and without ceremony of any kind, on the day appointed by the Legislature—the 24th of June—into the hands of their new owners. In this case, as in not a few others, private enterprise had initiated and carried on for more than three centuries a work of immense importance to the health and well-being of the inhabitants of the Metropolis; and it was only natural that the present-day successors of the early pioneers should feel a certain amount of regret at relinquishing the control of undertakings with which their life-work had been so closely associated. But this had become inevitable; and their consolation has been found in the reflection that the works they have handed over are all they have been represented to be. The constitution of the body which now controls them may not be ideally perfect; indeed, it is still thought by some that it should not have been called into being while there was in existence a Central Council desirous and fully capable of undertaking this onerous responsibility. We venture to predict that those who think thus will be led in time to change their opinions. The Metropolitan Water Board have already shown administrative ability which has met with general approval, and they will gain experience with years. At all events, they are more fitted for managing the water supply of London than a body which is now confessedly overworked. The public, it must be admitted, have had to pay dearly for the property they have acquired; but we think they may rest assured that their representatives will manage it for them on the best and most economical lines.

Turning from the Metropolis to the Provinces, the notable event of the year has been the inauguration on the 21st of July, by their Majesties the King and Queen, of the great water-works carried out by the Corporation of Birmingham for bringing to the capital of the Midlands a supply of water from Wales. It marked the completion of a scheme which had been in progress for upwards of ten years; and it could not have been otherwise than gratifying to the citizens to find that it had received Royal favour. It will give them 27 million gallons of water daily, while providing a similar quantity for the benefit of the River Wye; and when additional reservoirs are constructed in the future, the supply to the city will be brought up to 75 million gallons per day. The Welsh water that started upon its journey under these favourable auspices reached its destination a week later, and the next day it was flowing into the Frankley reservoir near the city at the rate of 8 million gallons a day. A supplementary function took place early in October, when, on the invitation of the Water Committee, the members of the Corporation, the chief officials, and a numerous company visited that reservoir and the adjacent filter-beds, which complete the section of the scheme inaugurated by the King. Opportunity was taken by the Lord Mayor (Sir Hallewell Rogers) to give the guests an idea of the immense amount of work which the carrying out of the great scheme had entailed on the Water Department, and to pay a well-merited tribute to the devotion to the public service of Alderman Lawley Parker, the Chairman of the Water Committee. By the middle of December, the Welsh water was being furnished to the whole of the high and middle levels. The combined labours of the Committee, the officials, and the Engineer have provided Birmingham with a supply of water which it is hoped may be sufficient for many years; and they have thereby earned the gratitude not only of present citizens, but of those who will succeed them.

Another important piece of water-works engineering successfully accomplished was the second pipe-line from Thirlmere to Manchester, the last section of which was laid at Scandale, near Ambleside, on the 26th of October. The work, which had occupied about two years and a half, was carried out under the direction of Mr. G. H. Hill, the Water Engineer of the Corporation, and its completion brought relief to the city at a critical time. Reference has been already made to the enforced curtailment of the supply of water, owing to the long continuance of dry weather. When the additional pipe-line was finished, the stock was very low indeed; but the auxiliary works were brought into use as quickly as possible, and by the middle of November the pipe was conveying into the city, in a perfectly satisfactory manner, its full quantity of 12 million gallons daily. The Water Committee placed on record, in a formal resolution, their high appreciation of the admirable manner in which Mr. Hill had carried out the work. Passing from Lancashire into Yorkshire, the completion of a portion of the works which are being constructed by the Corporations of Sheffield, Rotherham, and Doncaster in the Little Don Valley has to be noticed as an event of the year. On Oct. 17, when an official visit was paid to the Langsett reservoir for the purpose of closing the valve in the valve-tower, in order to allow the reservoir to fill, an opportunity was taken by Mr. Watts, the Engineer of the works, to give a full description of them. Early in the spring, an addition was made to the storage capacity of the Liverpool Water-Works by the inauguration, by Lady Derby, of a reservoir at Prescot capable of holding 122 million gallons. At the close of May, the Mayor of Newport (Mr. Clifford Phillips) formally opened, in the presence of most of the members of the Corporation and a large number of visitors, the Wentwood Water-Works, situated between Newport and Chepstow, which had been in course of construction for upwards of ten years, and had entailed an outlay of nearly £400,000. Among the works of less magnitude completed during the year, we may note the reservoir and pipe-line constructed for the supply of the Bridgwater district at a cost of £25,000, and opened at the close of June by the Chairman of the District Council (Mr. G. E. Lansdowne); the unique and difficult scheme of water supply for Gainsborough devised by the late Mr. Jabez Church, and successfully carried out, after occupying nearly ten years, by his successor, Mr. Percy Griffith, M.Inst.C.E., F.G.S.; the additional water-works for Ilfracombe, opened in July by Viscount Ebrington, Lord Lieutenant of Devonshire; the new works for Ilkeston and Heanor at Meerbrook Sough; a new reservoir for St. Helens; extensions of the Bath Water-Works at Oakford; new works for Honiton, Pemberton, and Street; and others for the supply of Ticehurst and district.

From the works completed, we pass naturally to notice those commenced or in progress during the year. In September the initial steps were taken by the Leeds Corporation to carry into effect the powers obtained by them in the session of 1901 for providing the borough with an additional supply of water from the tributaries of the Ure, in accordance with plans prepared with Mr. T. Hewson, the City Engineer. The completion of this scheme will, it is estimated, furnish Leeds with an ample supply of water for thirty or forty years. About the same time, work was commenced on the Geltsdale scheme of water supply for Carlisle, under the supervision of Messrs. Mansergh and Sons. A project which was at one time jeopardized by complications with which our readers are familiar is now fairly on the way to realization. The great works on the Derwent which are being carried out by the Derwent Valley Water Board were inspected in August by the Chairman (Alderman Gainsford) and a large party composed of members of the Sheffield Corporation and others, who were able to congratulate the Chief Engineer (Mr. E. Sandeman) on the satisfactory progress he had made with them. Earlier in the year, the Tynemouth Corporation, with representatives of the District Councils on the east coast of Northumberland, visited the works which the Corporation have in hand for bringing a supply of water from the Font to Tynemouth, which are estimated to cost £430,000. This scheme involved the acquisition of the undertaking of the North Shields Water Company. The reservoir inspected, with which good progress has been made, will store 730 million gallons of water, or about 180 days' supply. Two interesting ceremonies took place in connection with the Nidd Valley scheme of the Bradford Corporation in July, when the Mayor (Alderman Wade) cut a turf in connection with the light railway to be constructed between Pateley Bridge and Lofthouse, and the Chairman of the Water Committee (Alderman Holdsworth) performed a similar ceremony at the site of the reservoir at Agram, which, when completed, will hold 1000 million gallons, and will cost nearly £400,000. A few weeks ago, the Barnsley Corporation sought financial assistance from the Local Government Board to enable them to carry out their Midhope reservoir scheme. Works of a less important character have been projected or initiated during the year in connection with the water supply of Coventry, Fleetwood, Glossop and Hyde, Highbridge, Midsomer Norton, Selby, Skegness, Skipton, and South Holderness. In connection with this section of our retrospect, it may be convenient to mention that the Metropolitan Water Board transferred portions of their acquired property to the Local Authorities of Croydon and Richmond; the Manchester Corporation entered into a fresh agreement for the supply of Salford with water; the Teignmouth District Council came to an arrangement with the Paignton District Council to obtain a supply of water from their new works on Dartmoor, thereby putting an end to a controversy which has been going on for some years; and the Corporation of Todmorden acquired from the Rochdale Corporation, for £18,000, the water-mains and other plant employed in the supply of their district.

The parliamentary business of the year does not present many features calling for notice at length. Moreover, the Acts of the past session have been so recently summarized as to render further reference to details unnecessary. It may, however, be briefly recorded that there were throughout the session evidences of a desire, by both companies and corporations, to improve their works and extend their limits of supply. The latter is called for by the growth of population and the expansion of districts; and the former follows as a natural consequence. Increased business means more capital; and the necessary powers to raise it were granted. In one case—that of the Brymbo Water Company—permission was obtained to offer unsold stock to "shareholders, "employees, or consumers." Provisions for the protection of works and water from pollution, and for limiting the powers of the applicants in regard to sources of water, were significant features of the Acts. A Company was incorporated for the supply of Littlestone-on-Sea; and amalgamation was sanctioned between the Ticehurst and Robertsbridge Water Company and the Wadhurst, Ticehurst, and District Gas-light and Coke Company, for the more efficient supply of their districts. The Gosport Water Company were empowered to purchase the water-works at Lee-on-the-Solent;

and the Minehead Urban District Council obtained authority to acquire the undertaking of the Minehead Water Company. The constitution of a Joint Board was sanctioned to take in hand the water supply of Oakengates and Dawley, in Shropshire. Some rather important changes in the scheme which is being carried out by the Derwent Valley Water Board received the approval of the Legislature; and the Manchester Corporation obtained power to construct a reservoir, with subsidiary works, at Heaton Park. A unique feature of the water legislation of the year was the New River Act, by which provision is made for the application and distribution of the water stock issued to the Company in discharge of the sum payable as compensation for the transfer of their water undertaking to the Metropolitan Water Board, for the reconstruction of the Company, and for its registration under the Limited Liability Acts. By this piece of legislation, the existence of a remarkable Company, constituted centuries ago by Royal Charter, will be prolonged in a different form; and this alone is sufficient to invest the water legislation of the session with special interest. Another feature worthy of note was the rejection by a large majority, on second reading, of the Rickmansworth and Uxbridge Valley Water Bill, on the ground that the promoters proposed to take water out of one county to benefit another without making compensation for it.

Questions concerning water supply have occupied all the Courts, from the lowest to the highest, during the year. The cases that call for first notice are those which arose in connection with the Metropolitan Water Arbitrations. Early in February, the Court of Appeal (consisting of the Master of the Rolls and Lords Justices Romer and Mathew) had before them a special case stated by the Arbitrators as to whether or not the undertaking of the East London Water Company, as transferred to the Metropolitan Water Board, was subject to the payments to the Chamberlain of London's sinking fund created by certain of the Company's Acts. The decision of the Court was against the Company; and it affected two others—the New River and Grand Junction—who had agreed to be bound by it. Next came an appeal by the New River Company of a more complicated nature. Five decisions of the Arbitrators were in dispute; but one had been disposed of by the judgment in the East London case. Their Lordships took time to consider this matter, with the result that they supported the view taken by the Company. The Water Board appealed to the House of Lords against the decision of the Court on the four points, and the Company against the ruling as to the sinking fund. In the result, the Board were successful, and the Company failed in their cross appeal. It must be recorded, however, in connection with this important litigation, that the Lord Chancellor dissented from the judgment of his colleagues (Lords Macnaghten, James of Hereford, and Lindley). The Court of Appeal also decided adversely to the Chelsea Company a question, also arising on the Arbitrator's award to them, as to their power to pay a further dividend on part of their capital. Early in the year, the Court of Appeal were called upon to review two decisions of Lower Courts on water questions. The first was by Mr. Justice Bigham, as to whether the Northampton Corporation had power to differentiate the water-rate. His Lordship said they had not; but the Superior Court held a contrary opinion. The second was a decision by Mr. Justice Wright that the "peculiar adaptability" of a site for a reservoir was a proper matter to be taken into consideration in assessing compensation. The Aspatria and Silloth Joint Water Board appealed; but they were unsuccessful. A question arose between the Bridport Water Company and a consumer as to their power to raise their charges under a contract without giving him formal notice. They failed to sustain their contention before the Justices, whose decision was upheld by the Superior Court. The "domestic supply" question came up once more before Mr. Justice Buckley, in connection with the supply of water by the South-West Suburban Company to the Workhouse Schools at Southall. The Guardians claimed to be supplied on the "domestic" basis at a percentage rate; the Company disputed their right to put forward this claim, and declined to afford a supply except by measure. His Lordship decided in their favour. Defendants entered an appeal, but subsequently withdrew it.

The Grand Junction Water Company were engaged in litigation apart from that arising from the arbitration proceedings already mentioned. They recovered damages from a consumer for wrongful use of water; successfully appealed against a conviction by a Magistrate for refusing to supply water to premises having defective fittings; and obtained the support of the Court to the Directors' scheme for the distribution of the compensation awarded under the Metropolis Water Act, 1902, to which objection had been raised by certain shareholders. The New River Company appealed to a Divisional Court from a decision of the Magistrate at Clerkenwell to the effect that local authorities have the right to charge a certain amount for supervision in addition to the sum actually expended in reinstating pavements after pipe-laying. The Lord Chief Justice thought the question was one of fact as to whether or not the cost of supervision was included in the expense of reinstatement; and he said the Magistrate had held that it was. The appeal was therefore dismissed; but the matter was taken to the Court of Appeal, who sent the case back to the Magistrate to have a direct finding of fact as to whether there had been any substantial extra expense incurred by the claimants (the Westminster City Council) owing to their undertaking themselves the work of reinstatement. A question as to the supply of water in out-districts arose between the Bilston District Council and the Earl of Dudley, and it came before the High Court on a special case. The question turned upon the construction of certain sections of two Local Acts; and the contention of the Council was upheld. His Lordship appealed; but, as will be seen by the report in another column, he was unsuccessful. The Weardale and Consett Water Company sustained in the High Court a claim which had been dismissed by a County Court Judge to be paid for water used for fire extinction. The Corporation of Tenby got into a dilemma in regard to an expenditure of £600 in connection with the raising of money to carry out a scheme of water supply. Mr. Justice Swinfen Eady had before him a troublesome case in which the Soothill Upper District Council sought to recover from the Wakefield Rural District Council and the East and West Ardsley District Councils the sum of £890 for water which they had not taken in accordance with the terms of an agreement. As the result of a considered judgment, his Lordship held that the plaintiffs were entitled to succeed. A millowner recovered £350 from the Burgess Hill Water Company for interference with the flow of water to his mill. An interesting question was raised by an action brought by the Hertfordshire County Council to make the Statute of Bridges of Henry VIII. apply to the New River Company in respect of maintaining the approaches to the bridges erected by them in making the New River. It was held that the statute cited was not applicable to the Company. Among the other legal work of the year may be mentioned cases bearing on the rating of the East London and Staines reservoirs and the Liverpool mains, and on the levying of water-rates. A personal action calls for notice here. Early in the year, Mr. Charles Hawksley and others associated with him in connection with the Llandrindod Wells water arbitration obtained a reversal of the decision of Mr. Justice Ridley, in April, 1903, to the effect that the Water Company were entitled to recover a sum of about £102 in respect of expenses incurred while they were professionally engaged for them.

Among the proceedings of a *quasi* legal character which have taken place during the year, a conspicuous feature is the arbitration in connection with the transfer of the London water undertakings. By the award to the New River Company of water stock of the value of £6,534,000 towards the end of November, the protracted inquiry was closed. The total cash payment for the undertakings was £30,662,323, which, at £91 6s. 6d. per £100, at which rate the Board had issued a large portion of stock, was equal to £33,575,243. An incidental arbitration is in progress, under Lord Revelstoke, to deal with the claims of the Directors for compensation. Owing to the death of Sir Frederick Bramwell, the Umpire in the Devonport water arbitration, before he could make his award, Mr. A. J. Ram, K.C., was entrusted with the duty. A difficulty arose which compelled him to name the alternative amounts of £268,123 and £209,920; and, as will be seen by the report in another column, the matter is still *sub judice*. Another arbitration, the result of which caused some commotion, was that to determine the amount the Liverpool Corporation were to pay Mr. Lever for a portion of his Rivington property; the claim being regarded as outrageous, and the award of Mr. R. E. Middleton as altogether too high. There were similar proceedings in

connection with other parts of the estate; and an arbitration was held as to an estate in the Nidd Valley required by the Bradford Corporation. An arbitration was conducted in May by Sir Hugh Owen as to the adequacy of the Denbigh Water Company's supply, and it resulted favourably to them. An important inquiry was held by Mr. E. Pollock, K.C., with reference to a claim by the Teignmouth District Council against the Contractor for their Hazeldown reservoir. An arbitration in which Englishmen are concerned, though the object of it is not in this country, deserves mention—viz., that between the Rand Water Board and the three local Water Companies, to determine the amount of compensation to be paid by the Board for their properties.

Coming to the general work of the year, the first event to call for notice is the meeting of the British Association of Water-Works Engineers at Hull in the summer, under the presidency of Mr. F. J. Bancroft, B.Sc., and the interesting visit to Belgium by which it was followed. The proceedings at the winter meeting, recently held, are now being reported in our columns. The papers and discussions show that the Association have done some very good work under Mr. Bancroft. The selection by the Junior Institution of Engineers of Mr. W. H. Lindley, of Frankfort-on-the-Main, as their President, is a noteworthy event of the year, in view of the wide range of his Continental experience in water-works construction. The review of the year must not close without reference to the congress of the Sanitary Institute in Glasgow, at which some interesting topics were brought forward. Various questions bearing upon water supply have engaged attention during the year. Mr. Percy Griffith urged, in a letter to the "JOURNAL," the advisability of establishing a Ministry of Health; the bearing of afforestation upon the conservation of underground water, and the utilization of flood water, received consideration; and village water supplies, river pollution, electric currents and water-mains, and the standardization of pipes and fittings all came under notice. There have fortunately not been many accidents to record. Three reservoirs burst, an attempt was made to destroy one by dynamite, and what looked very much like a dastardly scheme to poison the water in another was frustrated. Happily Death has not been busy in the ranks of the water engineering profession; and it is pleasant to record that some personal distinctions have been conferred. The Chairman of the Metropolitan Water Board (Mr. R. M. Beachcroft) and the Mayor of Birmingham (Alderman the Right Hon. Hallewell Rogers) both received the honour of knighthood; Mr. Alderman Lawley Parker, the Chairman of the Water Committee of the Birmingham Corporation, was made a freeman of the city, in recognition of his great services; Mr. W. B. Bryan obtained the post of Chief Engineer to the Metropolitan Water Board; and Mr. James Watson, of Bradford, received a substantial recognition from the Corporation for the extra work devolving upon him in connection with their Nidd Valley scheme. With these personal references, we close our retrospect of a year which has been by no means devoid of interest.

Sir George Livesey and the Directorate of the Commercial Gas Company.

After four years' association, marked by the utmost cordiality and good feeling, Sir George Livesey has resigned his seat on the Board of the Commercial Gas Company. His retirement was announced last Thursday at the meeting of the Directors, who unanimously passed the following resolution:—

> Resolved, that the Directors of the Commercial Gas Company have received with extreme regret the resignation of their esteemed and valued colleague, Sir George Livesey, who for the past four years has afforded to their councils the aid of his ripe and unique experience and his conspicuous ability; and their regret is accentuated by the fact that his resignation should have been caused by the necessity of the load of his public engagements being lightened. In taking leave of their distinguished colleague, the Directors beg to assure him of the sincere sorrow with which they place on record this event in the Company's history, and of the warm feelings of friendship and regard with which they trust that, thus relieved of a portion of his labours, he may be restored to complete health.

Without the duties which the directorship of the Commercial Gas Company entailed—duties which were discharged under the most friendly circumstances—Sir George will have more time to devote to the affairs of the two Companies of which he is Chairman; and it was with the view of obtaining this time that he decided to sever a connection which has never been marked by the least difference with any of his colleagues. We are pleased to learn that Sir George is feeling better and stronger than he has done for a long time.

CO-PARTNERSHIP, WORKMEN'S AGREEMENTS, AND PICKETING.

Sir George Livesey's Views.

IN spite of the changes wrought by the introduction of machinery, gas undertakings are, from the very nature of their business, still vitally concerned in anything that will tend to minimize the danger of a labour strike. It would be impossible to find an industry in which a sudden cessation of operations would be fraught with graver risk to the community than is the case with gas-works; and, human nature being what it is, this very fact must, under some circumstances, it is to be feared, go to increase the temptation to workmen to attempt to forcibly wring concessions from their employers by this means. We say "under some circumstances," for, of course, there are ways of removing the temptation; and in the interests of the men, the consumers, and the employers, this should be done. The strike as a weapon of offence is not particularly popular now; but it may come into fashion again, and hence the advisability of being prepared. As has already been mentioned, the extensive introduction of machinery into gas-works operations has effected a change in the position; but such concerns still remain large employers of labour, which renders other precautions desirable if officials are to be entirely freed from anxiety with regard to their men. On this subject there is no one connected with the industry who is so well able to speak with the voice of authority as Sir George Livesey, who (as was briefly recorded in last week's "JOURNAL") has lately been giving evidence before the Royal Commission on Trade Disputes and Trade Combinations.

Besides having been for a great number of years in close contact with workmen, Sir George has had personal knowledge of two strikes of gas stokers. The first of these (in 1872) extended to most of the London Gas Companies; but it died out in three or four days. To it, however, was due the clause in the Conspiracy and Protection of Property Act which made it a penal offence for servants of gas and water companies to break contracts of service. Had such contracts been made, the companies would not subsequently have found themselves at the mercy of the Gas Workers Union. But as this was not done, the Union could call out their members by giving the usual week's notice; and where this occurred, the companies perforce succumbed—the period named being too short for the procuring of new men. This state of affairs led up to the second strike in which Sir George was involved, and which is now matter of history. In September, 1889, notices were handed by the men to the South Metropolitan Company, who had to give in; but on the same process being repeated three months later, the Union found the Company thoroughly well prepared, with results as satisfactory to the latter as they were disastrous to the former.

All this, of course, took place many years before the celebrated Taff Vale judgment was delivered; and so at that time picketing was one of the strongest weapons in the hands of the Union. How powerful it was, will be readily understood when it is called to mind that nearly 3000 mounted and unmounted police kept the peace and enabled the new men to enter the six works of the Company. Alas for the tactics favoured by the Union leaders, the halcyon days of picketing on the scale then in vogue—in other words, of intimidation, and even worse—have gone, for the present, at all events. Hence all the pother. In spite of the Taff Vale decision, "watching and besetting" is still legal, if done "merely to obtain or communicate information." But this is not enough for the Unions, who realize the importance to them, for the successful carrying on of strikes, of a plan of campaign which has been declared, under the existing law, to be illegal. As a result, no less than three Bills were introduced in the last session of Parliament, any one of which would, in Sir George Livesey's opinion, if it became law, be a direct encouragement to repeat what happened fifteen years ago at the South Metropolitan Gas-Works at any gas undertaking in the kingdom that had not adopted the precaution of entering into a contract of service with its workmen. The Unions object to such contracts unless they all expire at the same time; and even then they do not like them. They have, however, with some important companies agreed to a month's notice on either side at any time. During the week, however, that the notices ran at the South Metropolitan works, a large force of police was on duty night and day to prevent destruction to the Company's property; and judging from the mischief done then, Sir George thinks it probable that in a month the concern would be rendered unworkable.

Under the present condition of things, Sir George Livesey firmly believes that a strike at either the South Metropolitan or South Suburban Gas-Works (of which he is also Chairman) is now impossible. No Trade Union has any power or influence in either Company; Unionists being not excluded, but simply ignored. Contracts of service are made with the men, usually for a year; and as individual agreements expire and are renewed every week, no appreciable number of men can leave at the same time. There is, however, as is well known, an even more important safeguard than this, in the fact that nearly all the regular employees of all ranks are holders of stock under the co-partnership system. These are the reasons why the respected Chairman of these two Companies considers that a strike or any trouble from Trade Unions is quite out of the question with them, as it is also

with one or two other undertakings. While admitting that there are some companies besides these who (through the adoption of agreements or contracts of service, with or without a cash bonus) are fairly protected, he points out that many are in an unprotected condition; and these would, in the event of one or other or the Bills referred to becoming law, be in at least as unsafe a condition as were the companies generally at the time of the big South Metropolitan strike. To his mind, the contract of service clause in the Conspiracy and Protection of Property Act does not go far enough, in view of the objections of the Unions to all such contracts, and of the supineness of the companies. Men who enter the service of undertakings in which any break in the continuity of supply to the public would be disastrous (such as the plunging of a town in darkness) ought not to be permitted to strike—especially considering that a lock-out is practically impossible. If, however, he says, companies would adopt the South Metropolitan and South Suburban system of agreements (with or without co-partnership or profit-sharing), they would be able to protect themselves. In any case, he contends that the protection against strikes given to gas and water companies by the Conspiracy and Protection of Property Act, already referred to, should be extended to all undertakings—such as railways, &c.—where constant and regular working is a public necessity, and where a stoppage would be a public danger.

To return to the question of picketing. One of last session's Bills was presented by Mr. Paulton; and the object of it was to make it "lawful for any person or persons acting either on their own behalf or on behalf of a Trade Union or other association of individuals, registered or unregistered, in contemplation of or during the continuance of any trade dispute, to attend for any of the following purposes at or near a house or place where a person resides or works, or carries on his business, or happens to be (1) for the purpose of peacefully obtaining or communicating information, (2) for the purpose of peacefully persuading any person to work or abstain from working. As to this, Sir George is convinced that by the words "any person or persons," nothing less is claimed than the right to attend in unlimited numbers for the sole purpose of intimidation. That a man willing to work in this free country should be exposed to besetting at his house or elsewhere by men whose object would be to prevent him from working, would be an outrage. It is, he says, sheer nonsense to give as the reason for this besetment the "peacefully obtaining or communicating information." If this were the honest object of the Bill, one or at most two men would be amply sufficient; and so an amendment of the clause by substituting for "any person or persons" the words "not more than two persons," could not be objected to. There would also be no harm in altering the words "attend for any of the following purposes at or near a house or place where a person resides or works, or carries on his business, or happens to be" to "attend at the gate of the place where a person works." Sub-section (1) might then stand, though, as a matter of fact, in a small business even two pickets might intimidate. Sub-section (2), of course, ought to come out; for "peacefully persuading any person to work or abstain from working," means intimidation, and nothing else. Clause 2 provides that "an agreement or combination by two or more persons to do or procure to be done any act in contemplation or furtherance of a trade dispute shall not be ground for an action, if such act when committed by one person would not be ground for an action." In regard to this, Sir George points out that action by one or not more than two persons would probably be quite harmless and legitimate, but such action by "more persons" could, and most likely would, mean gross interference with the liberty of the subject, and ought not to exempt a Union from legal proceedings. As to the final provision—that an action shall not be brought against a Union for recovery of damages sustained by the doings of a member or members—he maintains that the law as expounded by the House of Lords in the Taff Vale case is just. All other organized bodies are responsible for the action of their agents, and there is no reason or justice in the exemption of Trade Unions. At the same time, he holds that, while certain of the funds of Unions should be liable for damages in such cases, the subscriptions of the members for sick and superannuation purposes ought to be protected. A member, after paying his subscriptions (say) to the superannuation fund, may at any time be turned out of the Society by the Executive, and lose all benefits. The superannuation is often paid out of current income, and not from any accumulated fund; and many Societies are, he says, hopelessly insolvent.

The second Bill, which was introduced by Sir Charles Dilke, is much on the same lines as the one just alluded to; but clause 1 goes even further. It reads: "Where an act is done in contemplation or furtherance of a trade dispute, the person doing the act shall not be liable to an action on the ground that by that act he interfered, or intended to interfere, either with the exercise by another person of his right to carry on his business, or with the establishment or continuance of contractual relations between other persons: Provided that nothing in this section shall exempt such person from liability on any other ground." This, argues Sir George, is a more barefaced attempt to legalize for Trades Unions acts which in any other case would be actionable. That such bodies should be authorized and empowered to interfere either with the exercise by another person of his right to carry on his business or with the establishment or continuance of contractual relations between other persons, is an outrage on justice and common sense. There may possibly be even ground for the suspicion that if such powers were granted, the contracts of service made by the South Metropolitan Gas Company might be rendered null and void, if the men at the instigation of a Union were induced to break them and go on strike.

The restraint that has been placed upon picketing may lessen the temptation to strike by reducing the chances of success, and agreements are no doubt most desirable to prevent the men leaving in a body without notice (or practically so); but, of course, Sir George Livesey's sovereign cure for labour troubles is co-partnership. This, though difficult, and in some businesses apparently impossible, of accomplishment, he has shown to be practicable at least in the case of gas companies; but only two or three in this country and a few in America have followed his example. Gas undertakings, and some other important joint-stock companies, like railways, appear in his opinion to be made for the successful adoption of the principle of co-partnership. All that is needed is to include the employees of every rank; and in this connection some system of profit-sharing is useful. The great difficulty is, Sir George holds, in the constitution of the ordinary Board of Directors. Almost invariably there are some members opposed to all such innovations; and they are a dead-weight not easily moved. Others who are favourably disposed to the principle, look narrowly at the immediate cost, and cannot see the ultimate advantage; and these are almost as hard to move as the real opponents. Thus there may be left upon the Board one or two men ready and willing to make the forward move; but they are in a minority, and so powerless. Almost the only thing that can move an ordinary Board is the pressure of a great necessity.

In connection with efforts to combine more closely the interests of employers and employed, however, the opinion of Sir George (based, as it is, on considerable experience) should be borne in mind—that profit-sharing is only useful when it is made the stepping-stone to partnership by investing the bonus in the stock or shares of the undertaking. The distribution of the bonus in cash does more harm than good. It does not encourage thrift, and very soon loses its effect; and so, sooner or later, it must die a natural death.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 988.)

THE odd week between mid-month settlement and Christmas on the Stock Exchange gave evidence at once of its holiday character from the very opening. Small realizations led the way, and they tended naturally to put prices down a little; but the undercurrent of strength was sufficient to check any mischievous tendency. Then the attendance gradually dwindled away, and things got somewhat dull; but again takers were not slow to appreciate a bargain when they saw it. One depressing influence (especially on railways) was the state of the weather—a fog unparalleled for years; but even that, with all the rest, could not produce actual flatness. So, on the whole, prices have fared pretty well. In the Money Market, there was a nice strong demand; and in addition to the normal seasonable requirements, the special settlement in Metropolitan Water Board Stock came upon the stage. Discount rates, however, were no harder. In the Gas Market, business continued just as brisk as in the last few weeks; and the demand for some of the more popular issues showed no falling off. Certainly it is a notable revival in the public estimation of gas securities that we are now witnessing; and the persistent fogs in these the shortest days of the year are bound to strengthen the movement. It is not unreasonable to forecast that some of the daily returns of the gas sent out by the Metropolitan Companies will beat all records. In Gaslight and Coke issues, the ordinary was very active and very firm at close even figures. The range of prices was only between 99½ and 100¼; stock changing hands several times at the highest point. There was not much doing in the secured issues. The maximum marked 91¼-92, and the debenture 86½-86¾. South Metropolitan was rather quiet; and prices ranged from 130½ to 132. There were a few transactions in Commercials; the 4 per cent. realizing from 113¾ to 114⅜, and the 3½ per cent. making 110¼. The Company have made a successful issue of their balance of 4 per cent. stock, which was subscribed nearly four times over. Tenders ranged from 110 (the fixed minimum) to 115; and tenders at £111 12s. and upwards had an allotment in full. The Suburban and Provincial group were very quiet. Bournemouth "B" marked 163, British 40¾, and Brighton ordinary 165 to 166. Among the Continentals, Imperial ranged from 206½ to 208, European realized 20½ and 20¾, and Cagliari 25⅛ and 25¼. Of the remoter undertakings, Buenos Ayres was done at 11½ and 11 11/16, and the debenture at 97, River Plate at 11⅜, Cape Town at 15¼, and ditto preference at 9½ and 9⅝.

The closing quotations are shown in our stock and share list.

The late Mr. R. Kersey, the Chairman of the Bexhill Gas and Water Company, left estate of the gross value of £234,626; the net personalty amounting to £72,033.

THE FOG AND LARGE GAS CONSUMPTIONS.

THE dense fog which enveloped London last week particularly on Wednesday and Thursday, and was more or less prevalent throughout the country, was responsible for much inconvenience and distress. Outdoor work was largely suspended, trade paralyzed, traffic dislocated, and business generally interrupted; and this was made all the more serious by the fact that these were the few days preceding Christmas, which should, in the ordinary course of events, be days of great business activity. Amid it all, those responsible for the gas and electricity services worked hard to lighten the peril and inconveniences of the fog-bound streets, and to supply light and comfort indoors; and they succeeded well, for (it may be taken as one index) the tale of accident during the worst days has not contained such horrors as would have occasioned no surprise under the circumstances from which we were suffering during the week, if those circumstances had been intensified for the worse by a shortness of the means of artificial light

Such a continuation of fog as last week embraced, with little relief, is unprecedented we fancy in recent years. Gas engineers, their staffs, and men were kept at high tension, as the drain upon their resources was maintained without interruption through the round of each day. But strenuous effort and goodwill have carried them through the ordeal, right up to the time of the printing of this issue of the "JOURNAL" on Friday night—earlier than usual, in view of the Christmas Holidays. In London, there were on Wednesday and Thursday some remarkable outputs of gas; and in no district, so far as we know, was there any shortage of supply. It is reported that in the East-end the pressure had to be slightly decreased on Thursday afternoon; and one morning halfpenny paper on Friday found—we believe more in imagination than in fact—that there had been the previous day a "failure" in the supply in some parts of the district.

Gaslight and Coke Company.—The demand for gas in the area of the Gaslight and Coke Company was very heavy during the days of the densest fog. From figures obtained from Mr. T. Goulden, the Chief Engineer, relating to Wednesday and Thursday, it will be seen that, taking the two days together, the output was some 37,100,000 cubic feet in excess of the corresponding days of last year. The outputs were—

1903.	Cubic Feet.	1904.	Cubic Feet.
Dec. 21 . .	92,100,000	Dec. 21 . .	113,500,000
Dec. 22 . .	105,100,000	Dec. 22 . .	120,600,000

South Metropolitan Gas Company.—In the case of this Company, Thursday was a record one by a considerable amount. In the two days, the quantity of gas sent out from the works was greater than on Dec. 21 and 22, 1903, by 20,495,000 cubic feet. The comparative totals were—

1903.	Cubic Feet.	1904.	Cubic Feet.
Dec. 21 . .	50,096,000	Dec. 21 . .	58,112,000
Dec. 22 . .	50,294,000	Dec. 22 . .	62,773,000

In supplying these figures, Mr. Charles Carpenter—of course, quite naïvely—remarks that the Company could have gone on at the same rate throughout the week without water gas.

Commercial Gas Company.—Mr. Stanley H. Jones reported on Friday afternoon that the output of gas on the previous two days had largely increased. But it was not the highest attained; and comparison with last year was not sufficiently marked to warrant publication.

From many parts of the Provinces come reports of substantial increases; but there are one or two cases of recession which seem to indicate that the fog was not general in the great centres.

Birmingham.—The output of gas on Thursday, we are informed by the Secretary of the Gas Department (Mr. G. Hampton Barber), reached the high figure of 35,255,000 cubic feet; the distribution on the corresponding day of last year having been 29,666,000 cubic feet.

Manchester.—Mr. C. Nickson reports from Manchester that the Department experienced their record consumption on Wednesday—the total being 26,819,000 cubic feet; while the previous highest output (Dec. 27, 1899) was 26,164,000 cubic feet. On Thursday, the consumption was 25,887,000 cubic feet, as compared with 22,842,000 cubic feet last year. It was necessary to slightly curtail the pressure.

Liverpool.—From the Engineer of the Liverpool Gaslight Company (Mr. E. Allen), we learn that Thursday's output of gas was 19,900,000 cubic feet, as compared with 18,700,000 cubic feet on the corresponding date last year. He was anticipating a greater delivery on Friday.

Leeds.—Telegraphing Friday afternoon, Mr. R. H. Townsley stated that the maximum day's consumption in the week had been 17,800,000 cubic feet, against 16,900,000 feet last year.

Newcastle-on-Tyne.—In comparison with the corresponding day last year, the figures supplied by Mr. W. Doig Gibb show, there was a drop on Thursday in the output; but comparing the week, an increase. The send-out on Thursday was 13,163,000 cubic feet, as against 13,895,000 cubic feet in 1903. In the week ending on Thursday, the delivery was 92,977,000 cubic feet, as against 91,562,000 cubic feet in the corresponding week of last year.

Bristol.—The President of the Institution of Gas Engineers (Mr. D. Irving) at Bristol had an output on Thursday of 11,438,000 cubic feet; being an increase of 604,000 cubic feet.

Passing over the Border, there does not appear to have been any extraordinary fluctuation in output, judging from the figures from Glasgow and Edinburgh.

Glasgow.—Mr. Alex. Wilson, the General Manager and Engineer of the Corporation Gas Department, states that on Wednesday the output was 32,663,000 cubic feet, and on Thursday 32,614,000 cubic feet. For the corresponding days of last year, the figures were respectively 31,337,000 cubic feet and 36,744,000 cubic feet.

Edinburgh.—Mr. W. R. Herring wires that the output of gas on Thursday was 9,605,000 cubic feet; and on the corresponding day last year, it was 9,323,000 cubic feet. The maximum delivery this year was on Dec. 12, when it was 10,499,000 cubic feet.

ELECTRIC LIGHTING MEMORANDA.

Hammond v. Municipal Control at Dublin—Cheltenham's Extravagance—Prodigality in Street Lighting.

THE ostentatious display made by Mr. Robert Hammond, to prove (he gives his personal word that these were the sole motives) the righteousness of his cause and to confound his critics, in connection with the Dublin Corporation electricity undertaking has come to naught, as doubtless he thought it would. The result could hardly have been otherwise. The terrible muddle into which affairs electrical in the Irish capital passed has been—through the strenuous efforts which have been made to get free, including the appointment for the time being of Mr. Hammond in a consulting and supervisory capacity—partially surmounted; but the city is a long way from being out of the wood, as recent references to the matter have shown. The last heard of the subject was, save for a report or two from the Corporation Electrical Engineer (Mr. Mark Ruddle), that the present position was to be debated by a Committee of the Whole House, together with the offers of Mr. Hammond to take over the working of the undertaking on one or other of a variety of sets of impossible terms. The Whole House has met, and have had before them several reports; but, according to a brief published account of the result, the Committee did not even do Mr. Hammond the honour of considering the terms of his to commonsense people farcical proposals. They were, therefore, unanimous in agreeing with Mr. John Irwin, the Chairman of the Electric Lighting Committee, that if it would pay Mr. Hammond or his Syndicate to work the undertaking from London, surely it will pay the Corporation of Dublin. Consequently, it has now been decided to keep the working of the concern completely under municipal control. Furthermore, it has been resolved by the Committee of the whole House that the Electricity Committee shall undertake no further or additional constructional works until the Consulting Engineer has reported that the works covered by his agreement with the Corporation have been finally completed; but the passing of this is not to interfere with the present scheme, or any additions to consumers or extensions of mains, &c. The former part of this resolution appears to contain embers that only require fanning to produce further trouble between Mr. Hammond and the Corporation, who obviously are not in a particularly pleasant frame of mind over the position of their undertaking, after the heavy expenditure in which they have indulged, in order to put their property into a state of efficiency. The financial situation is such that the people of Dublin can hardly expect in the present generation to have electricity at the more moderate prices of many other cities and towns. Capital has been poured into the undertaking. Already loans to the amount of £392,747 have been sanctioned by the Local Government Board, and two further loans, amounting to £49,000, have been inquired into, to which has to be added the amount of Mr. Hammond's estimate of £60,000 to meet further expenditure to the end of 1906—these several sums making a grand total of over half-a-million. The concern is largely over-weighted with capital; and the people of Dublin are now only too well aware of it. Some of them are of opinion that, under the circumstances, it would be better to let the concern pass into the hands of Mr. Hammond, as, under any conditions, things could not be much worse than they are now. But the Corporation have uttered a very decisive "No." Is this expressive of a want of faith in Mr. Hammond?

As has already been briefly recorded, the report of Mr. James Swinburne on his investigation into the affairs of the Electricity Department of the Cheltenham Corporation was discussed at the last monthly meeting of the Council. It was a wordy debate, and evinced the breadth of the capacity of several of the councillors for talking at large round a subject without touching the essential and real controversial points. The fact of the matter is that, while no one will question the thoroughness of the engineering work that has been put into the undertaking, it is as gall and wormwood to the responsible councillors to be told plainly by words and facts that the prodigality of past administration has landed them into a financial marsh from which it is difficult to comfortably extricate themselves. The annual expenditure for

public lighting is a monstrous one, and yet the town is only, as the result, sufficiently lighted in some of the main thoroughfares, and in other parts dismally we believe, to a large extent still, by flat-flame gas-burners. And even with the extortionate charge on the ratepayers for this public electric lighting, there is an accumulated deficit of no less than £17,000, which will have to come on the rates, for there is not the slightest prospect of the undertaking being blessed with anything in the nature of immediate spare profits to liquidate the loss. It is not therefore to be wondered at that the Electric Lighting Committee now in power hesitate to expend more in the extension of public electric lighting, although pressed to do so. A small extension the Committee feel compelled to decline on the ground that it would add another £70 to the rates. At the same time, the electricity party in the Council is too strong for that body to openly and boldly declare that in this matter of extravagant public lighting, they have made a grievous and expensive mistake. They still compare the old flat-flame gas-burners, consuming about 4½ cubic feet per hour, with the electric arc lights of great intensity; and they fear to give the Gas Company a free hand, at perhaps a modest increase of expenditure on the cost of the old flat-flames, to show what they can do in the way of economical and efficient street lighting. But we look to the day coming when the ratepayers will object to be dominated by a Council whose guiding motto in this particular appears to be "Reform, with extravagance," and who refuse to clear off at once the burdens of past recklessness and cut them down for the future. However, the report of Mr. Swinburne substantially confirmed the charges levelled by the critics against the former administration of the electricity undertaking. And though, in the discussion in the Council, there was a feeble attempt to belittle the report on side-issues, no one dared to say much on the expert's criticisms, supported as they were by ugly facts. The truth of the criticisms is reflected in the fact that, much opposition talk notwithstanding, the recommendations the Electricity Committee based on the report were adopted with only one dissentient. Except in one important respect, and in one or two minor particulars, the advice of Mr. Swinburne was accepted. The most important rejection was the suggestion that a depreciation and antiquation fund should be brought into existence. What more need be said as to the condition of the undertaking when the excuse for not favourably entertaining this advice was that it was felt the burden on the rates would be too great, taken in conjunction with the accumulated deficit. The release of Cheltenham from electrically-produced burdens does not appear to be so near at hand as we imagine the ratepayers would prefer.

The Electricity Department of the Edinburgh Town Council is not suffering (like so many kindred undertakings on a more modest scale, and with districts of less affluence) from the difficulty of making both ends meet; and therefore there is no need for the Committee to rob Peter to pay Paul—Peter representing those long-suffering ratepayers in many towns who are made to pay handsomely for the "luxury" of public electric lighting in order to support the electricity undertaking, which Paul represents. But all the same, those responsible for the conduct of even the Edinburgh Electricity Department, cannot discipline themselves to rules of moderation and economy. This was forcibly shown by an illustration at the meeting of the Council last Tuesday. True it is only a small illustration; but apply it to the whole of the public lighting, and its illustrative importance is seen. The Cleaning and Lighting Committee recommended that a portion of the Portobello Road, extending from Piershill to Portobello, should be lighted by incandescent gas-burners, in place of the present flat-flame burners. The extra annual charge will only be £16 3s. 4d., while for arc lighting it would be £160. It was on the ground of economy that the recommendation was made, and—this is a statement pregnant with importance coming from Bailie Mallinson, the Convener of the Committee—"all the more as the experiments they had made with this mode of lighting showed that it was quite as efficient a method as the electric light." The Convener of the Electric Lighting Committee (Mr. Stevenson) proved his title to be called an apostle of municipal extravagance. He argued that it would be preferable to pay the extra £160 for electric lighting, on the ground that there would be nine times more light. Assuming that there would be, is it required? and, if not, then the £160 would be waste, and a waste that would go on not for a single year, but year after year; while the difference between the £160 and the £16 3s. 4d. will be a saving year after year. Mr. Stevenson made this strange little calculation (he believes that he is correct about the illuminating power): If for £11 the Electricity Committee can give nine times more light, then the price for the incandescent gas-lights should be £1 4s. 5d. each, as compared with the £2 to be charged. But why spend £11 when £2 will do? That is a simple question that Mr. Stevenson must often put to himself when dealing with his own private money; and we invite him to revolve the question in his mind when considering the expenditure of the ratepayers' money. When the City of London and other Metropolitan Authorities, for important situations, are giving their preference to gas, and not to electric arc lamps, we are inclined to think that gas will suffice for the Portobello Road in Edinburgh. The pronouncement of the Chairman of the Lighting Committee that he and his colleagues are convinced that incandescent gas lighting is as efficient as electric lighting is in agreement with the best of municipal opinion.

GOOD FELLOWSHIP AT EARL'S COURT.

When writing the account of the last day at the Gas Exhibition, it was thought that that would be the final special reference that would have to be made to the subject; but it is not so. Incidents of a more or less noteworthy character are, of course, bound to follow such a big event; and one succeeded as quickly as Monday evening last. By the more observant, it was obvious that among the managers and assistants at the stands, a true spirit of *camaraderie* prevailed throughout the course of the exhibition—no matter whether in the same or distinct lines of business; and in no small degree, it must be said, the interest of the exhibition from the visitors' standpoint was greatly enhanced by the courteous manner in which information was tendered and supplied on request, without any suspicion of "touting," excepting perhaps in a few isolated instances which may very properly be ignored. It is true that a decent array of orders and inquiries were to be found in the books of the exhibiting firms at the close of the exhibition; but, at the same time, the gentlemen in charge of the stands fully recognized the primary object of the exhibition, and that the *rôle* they were expected to fill was something more than that of salesmen.

However, they stuck to their work with the utmost diligence during the run of the exhibition, and each day until late at night. They resolved that as they had worked side by side they would not as a body part company without having together a little farewell dinner, and this they did—to the number of about seventy—in the grill-room at Earl's Court on Monday night last week. To get to the grill-room to join in the entertainment, one had to pass through the main entrance, along the corridor, and through the Ducal Hall. What a change! Sunday work had been prohibited; but nevertheless what met the view showed the shortness of the step from the brilliance and gaiety of forty-eight hours before, when the big crowd were gazing with rapt admiration on the beauties of the lighting and the thousand and one varieties of goods exposed to view. By Monday evening, the stands were being dismantled; many, if not most, of the exhibits had found their way into packing-cases and protective coverings ready for removal; and workmen were busy disconnecting machinery, and bringing it to a condition for ready transport. All was disorder where order reigned at ten o'clock on Saturday night.

Reaching the grill-room, a jovial company of gentlemen were found who had been doing assiduous service for four weeks in the neighbouring halls; and in the chair was Mr. John Glover, of Messrs. Thomas Glover and Co., Limited. The dinner was well served, and thoroughly enjoyed. Then a couple of hours were spent in listening to speeches accompanying the proposing of and responding to toasts, and in enjoying music provided by a small band of artistes. A few points from the speeches may be noted. In proposing the loyal toast, Mr. Glover made a happy point in his allusion to the Prince of Wales's injunction to Britishers to "Wake up." He pointed to the exhibition as a proof that at all events in the gas industry we were fully awake not only to the necessities of the times, but to the competition from abroad. The toast of "The Representatives of the Exhibitors" was well handled by Mr. Smith (Messrs. Bridges and Smith); and he heartily recognized how much he and his partner, as the Organizing Managers, were indebted to the gentlemen present for the help they had rendered towards making the exhibition a success. He expressed his regret that, notwithstanding this exhibition had been such a success, it was too much to hope that the exhibiting firms would come forward in the same way in another immediate year. It was realized that the firms who had assembled at Earl's Court had gone to an enormous expense in showing to the world what gas could do. There was no doubt, added Mr. Smith, that the foreign representatives who came over to see what was being done here went back with something in their pocket-books—something, he rather fancied, that they did not expect. However, he said this with all respect to their foreign friends. A neat speech was made in reply by Mr. S. H. Truscott, who referred to the pleasant personal associations they would all retain in connection with the exhibition. Though he was afraid it would be many years before they were brought together again in such numbers at an exhibition, he expressed the hope, which reflected that of all present, that the next exhibition would see them one and all still in position, and connected with as good firms as they were representing that day. The Chairman proposed "The Visitors;" and Mr. Webber was first to reply. He acknowledged that, although he thought he knew something—though a very little—about the resources of the gas industry of the country, he had been absolutely amazed at the revelation the exhibition had been of what that industry was. The display had indeed been of the greatest credit to the manufacturing industry; and one of its principal glories was that nothing had been specially produced for the purpose. Mr. Bridges was also included in the toast; and he registered his testimonial that the exhibitors could not have had a better class of men to represent them. Mr. C. H. Ditchman, Inspector for the West Kensington District of the Gaslight and Coke Company, was also called upon. He remarked that the exhibition had been satisfactory to all the exhibitors; and he hoped the little bit that he had done had also been satisfactory. He might perhaps say, as a point of interest, that, in order to supply the exhibitors, it was necessary to put in about eleven miles of pipes. The hours of labour expended on the work totalled

to 29,379; and he cut the labour down as closely as he possibly could. It had been his endeavour, so far as the work was under his control, to give the utmost satisfaction.

The toast of "The Chairman" evoked the utmost enthusiasm. Responding to it, Mr. Glover remarked that now they all knew what a gas exhibition was, and what one ought to be. The exhibition had been nothing short of grand; and they were much obliged to Messrs. Bridges and Smith for the manner in which they had organized it. Then there was another thing he should like to say. The "JOURNAL OF GAS LIGHTING" was one of the first to ever put pen to paper to help them on with the exhibition The "Gas World," too, helped them along, as well as the general press. But these gas papers had used their best and honest endeavours in showing in print what gas could do. On the question of foreign competition, he said he was glad to see everything that could be done abroad—whether it was from Germany, France, Belgium, or anywhere else. He was not ashamed to say that he had picked up one or two suggestions and ideas from their friends from across the water; but because of this, he did not think old England was dead yet. There was room for all; and so there was in the case of rival illuminants. He knew, as a positive fact, that there were more candles and more oil-lamps made at the present time than formerly; and yet gas thrived. Where, too, the electric light came in to oppose gas, the result for gas was more orders, more success, more capital, and more energy. Then the Chairman went on to speak of municipal trading, and showed his strong antipathy to the present objectionable practice of "pawning the rates." "Cash down" is an excellent business principle, which Mr. Glover would evidently prefer to see applied to local authorities.

The company could not at this season of the year separate without a turn at "Auld Lang Syne," followed by the "National Anthem."

BENZENE AND POISONING BY COAL GAS.

IN a communication to the Royal Society, Dr. R. Staehelin gives an account of experiments conducted by him at University College to ascertain the difference which exists between the poisonous action of coal gas and of carbon monoxide. He first investigated the effect of deprivation of oxygen on the fatigue curve of muscles. To this end, a muscle was hung up in a closed chamber, and the atmospheric air driven out by a stream of some other gas. When coal gas was used for the purpose, the muscle rapidly went into *rigor mortis;* whereas in nitrogen and in carbon monoxide it remained excitable for many hours. Among the other constituents of coal gas that could produce this phenomenon, benzene ($C_6 H^6$) received first attention, since all aromatic bodies are more or less potent poisons. On passing coal gas through the tube, the muscle began to contract in from one to seven minutes, and in from half to one hour it was maximally contracted, from which no recovery took place. On passing air through benzene into the muscle chamber, the contraction began in less than one minute; and on passing coal gas into an analogous chamber containing the other sartorius of the same frog, it began to contract only after several minutes. Experiments of passing benzene (*a*) through water and (*b*) through oil *en route* to the muscle chamber showed the effect to be very much reduced in (*a*) and absent in (*b*); and coal gas passed through oil, showed no difference in its effects from pure carbon monoxide or nitrogen. When toluene and xylene took the place of benzene, no poisonous effect was observed, probably owing to their lower vapour tension; and when air passed over heated naphthalene was tried, the contraction was *nil*. Methane and acetylene, as well as air, blown through petroleum ether gave negative results; but when a trace of benzene was added to the petroleum ether, *rigor mortis* was at once produced.

Experiments on frogs exposed to coal gas showed that motor phenomena are produced which are absent if the coal gas be previously passed through oil, and that these phenomena can be reproduced if the gas thus freed be again made to take up benzene vapour. The behaviour of the frogs showed that the action was a direct one upon the muscles as described in the first experiments, and that the effect of the poison was on the central nervous system. Dr. Staehelin after describing the physiological effects, concludes that it is possible to refer the difference between intoxication by coal gas and that by carbon monoxide entirely to the influence of benzene, which determines in its first stage vigorous excitatory motor phenomena. In warm-blooded animal, the conditions are quite different. Dr. Lorraine Smith (*vide* the report of the Water Gas Committee presented to Parliament in 1899, Appendix VII., p. 127) found that an addition of 0·65 per cent. of benzene to air had no effects on a guinea pig; and Santesson did not succeed in producing either acute or chronic poisonous effects by administering benzene to a rabbit by inhalation. In man, too, cases of poisoning by benzene are few and far between. It is possible that the minute quantities which are absorbed by the lungs are rapidly oxidized and excreted as an aromatic sulphate. At any rate, in man benzene plays no part in the poisonous effects of coal gas; and there is no reason to suppose that the action on mammals is determined by anything except its content in carbon monoxide.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

In the "JOURNAL" last week (p. 914), the meeting of the members of the Western District of the above-named Association at the Technical College, Glasgow, on the 17th inst., under the presidency of Mr. JAMES LOWE, was briefly noticed. It was then stated that a paper on the subject of "The Relation of the Gas Industry to its Consumers" was read by Mr. T. Orr, of Motherwell; and that Mr. S. B. Langlands gave an account of his visit to the Gas Exhibition at Earl's Court. The scope of these communications will be gathered from the following abstracts.

Mr. ORR began by pointing out that there is often much misconception in the minds of gas consumers in regard to the management of gas-works and the relation of the industry to its customers. A gas company is a concern constituted primarily to supply a public necessity—light—during the hours of darkness; but latterly gas has become a household requisite for cooking and heating purposes, and is extensively used for motive power. He went on to explain the conditions under which gas companies carry on their business, and to show that the consumers have a direct and by no means an insignificant interest in them. He compared the prices charged thirty years ago with those now general—8s. to 5s. per 1000 cubic feet then, against 4s. to 2s. 6d., and even less, now; and he showed how consumers are obtaining in these latter days, for the same money, double the lighting capacity they had formerly. He gave examples of the benefit derived by the consumers from the adoption of modern methods of manufacture, and emphasized the point that while the industry is decried as a "monopoly," the consumers have become, to all intents and purposes, partners in the concerns engaged in it. Nevertheless gas men—whether directors, managers, collectors, or what not—have abuse heaped upon them, and they are "shot at" all round without mercy or compunction. Mr. Orr defended the two first-named classes from the attacks made upon them, and stated briefly the true facts in connection with these much despised and wholly unappreciated public servants. He pointed out that directors have necessarily to consider the shareholders' claims first, as required by Act of Parliament, and because they are their officers; but, on the other hand, they must, and do, carefully regard the consumers' interests. When a reduction (say, of 3d. per 1000 cubic feet) is made, they get no thanks—the concession being taken as something that ought to have been granted long ago. But let the price be raised by so little as 1d., and at once there is a howl of execration from all sides. Mr. Orr went on to say that it is the best policy of directors to order, and of managers to make, gas good in quality not only as regards illuminating power, but also in point of purity; and he pointed out that this is usually the policy adopted. Many companies, by their Special Act, are allowed to supply gas of as low quality as 14 or 15 candles, whereas in order to meet the requirements of their district they actually make it up to 18 or 19 candles. For this they get no credit, though, as a matter of fact, each candle extra costs from 1d. to 1½d. according to locality, so that many companies could reduce the price by adhering strictly to the letter of their constitution. The discount system, which is in vogue in some places, is generally successful; but it occasionally causes discontent among the few who by their own carelessness miss getting it. The system involves no more inconvenience to the consumers than the call of a collector, perhaps several times repeated, used to do; and it is a matter of great economy to the company. It is also to the interest of the consumers, to whom it means perhaps a reduction of 1d. in the price of gas by the saving effected. "Dear gas" is a chronic complaint. A scattered country district, with miles of only partially productive mains, is inconsiderately presumed by many to be in the same position to obtain gas from its local works as a town with its streets of closely-built houses, shops, workshops, &c. One hears regularly the pathetic laments that in the country the price of gas is 3s. 6d. per 1000 cubic feet, whereas in the adjacent town it is only 2s. 6d. Comparatively, the former price may be much the cheaper, if due regard is paid to the different circumstances of the two cases. The author concluded by saying that, on the whole, it might be claimed for gas companies that for very many years they have supplied a necessity of the times; that they have been good and useful public servants; and that they have done, and are still doing, their duty by their customers just as much as by their shareholders. The point he thought it most desirable to emphasize was that they are well-regulated, progressive commercial enterprises, directed and managed on sound business principles, not altogether nor exclusively in the interests of shareholders, as is so generally supposed, but to a very appreciable extent with due regard to the interests and for the benefit of their customers. In short, gas companies of to-day are not the absolute and perpetual monopolies of bygone years, if only for the weighty reason that the total economies that have brought the price of gas everywhere down to its present low point have thereby been appropriated absolutely by the consumers.

The PRESIDENT said the members had heard Mr. Orr's very interesting paper. The subjects he had chosen to address them upon bulked very largely at present. The uses of gas had vastly increased during the last twenty years. Perhaps it would not be wrong to say that during the past ten years the consumption of gas by flat-flame burners had remained practically constant, if,

indeed, it had not gone down; and the increase in consumption that had come about had been due to its use for other purposes—in gas-fires, gas-stoves, and incandescent burners, which might be included in heating. Most towns had a greater load now for heating than for lighting. Probably in most places the load for heating was not so great as it ought to be, and as they hoped to make it in the near future. The reduction of the candle power of gas was perhaps a subject which might be introduced with advantage into the discussion of the paper. Mr. Alexander Dow, of Glasgow, being unable to read his paper on "The Control of Gas from Main to Burner," Mr. Langlands had very kindly come forward to give them some "Notes on the Earl's Court Exhibition." Perhaps the members had better hear Mr. Langlands, and have the discussion upon both communications together.

Mr. S. B. Langlands (Glasgow) said he had been asked by the President to fill a gap. It was no easy task, but he must make the best of it. He wanted to talk with the members about some of the exhibits at Earl's Court, and to discuss their seeming merits and demerits. He went to the exhibition expecting a great deal; and he had his expectations realized. It was said that anticipations were best; but this time the satisfaction was in the fulfilment. The Institution of Gas Engineers had done a great work, and the harvest from their sowing should be bountiful. No other means of gaining information regarding material things could be put before inspection. Many systems of lighting were shown, the quantity and quality of light thrown around being enough, he should think, to satisfy even a London Gas Examiner. The various high-pressure incandescent systems—such as the "Millennium," the Sale-Onslow, the Pharos, the Keith-Blackman, and the Sugg—useful for illuminating sheds, workshops, halls, and, in fact, any large areas, attracted attention. Lamps such as the Lucas, Humphrey, Bray, and Podmore, for indoor and outdoor purposes, were shown. People who wanted the maximum of light with the minimum of attention could be safely told to put up any of them. Devices for the instantaneous ignition of gas, controlled pneumatically or by a magnet, were on show, and seemed perfect enough for daily use. The making of mantles, from the scutching of raw ramie to the final immersion in collodion, was delightful to watch. The cooking and heating appliances on view were legion; and firms seemed to vie with each other in affixing labour-saving devices to their special fires or cookers. The glorious colouring of the enamels on some of the fires would delight even an artist of the "Glasgow School." Radiators for hall and office warming were booming this season; and the reason ascribed by exhibitors for the demand was the ease of working. He felt specially interested in gas appliances adapted for such purposes as book-binding, japanning, wire-drawing, laundry work, enamelling, &c. There was a field for them there. Let them plough this fallow ground, and reap increased makes. Gas-engine makers had much on show. The newer attachments were patent easy-starting gear, special centrifugal ball governors, and covered-in cranks. Notice was taken of gas manufacturing and distributing plant, including coal and coke conveyors, the Settle-Padfield retort-setting, the Jäger grids, Marsh's rotary meter, and lock-bar pipes. The author concluded by saying he held no briet for any of the appliances described. If he were too enthusiastic, it was a good fault. The exhibition closed that day; the fruits of it would be gathered far on into the future.

The President asked the members to give a very hearty vote of thanks to Mr. Orr and Mr. Langlands for the contributions they had had from them—a call which was cordially responded to.

Discussion.

Mr. R. Cowie (Glasgow) thought Mr. Orr had not treated his subject exactly as he (the speaker) would have expected him to do. He thought he would have dealt with the various points which make the relationship between the gas industry and its consumers what it is. For instance, the point of supplying gas at a lower price to consumers using it for power; also the questions of hiring out stoves, the meter-rents and prepayment meters, and perhaps also supplying mantles and incandescent burners and maintaining them. All these were points which made the relationship between the consumer and the industry what it was; and he expected Mr. Orr would have dealt with them. Though he had not done so, perhaps they might discuss these points.

Mr. P. M'Dougall (Airdrie) asked Mr. Orr to give them the difference in the price which they charged between ordinary and prepayment meters, to cover the expense of collecting the money. In Airdrie, the difference was 1s. 3d. per 1000 cubic feet. Some meters were fast and some slow, and they had to charge it on the balance at the collection. Some people paid quite readily, but others would not do so; there was a fight, and in the end they had to take the meter out. It might be better if cash were given back, and a reduction made for prepayment meters when one was made for ordinary meters. He thought also, in connection with complaints, that where the pressure was high, in high districts, the consumers usually had small burners in, which was the cause of many of the complaints; and he knew they considered they were saving gas in this way.

Mr. J. Mann (Glasgow) agreed that a demand for gas for heating purposes should be encouraged, because it was a day demand, and gas could be produced cheaper then than at any other time. He considered that the only legitimate charge which should be made against gas so used was the cost of manufacture, the repairs in connection with the works, and the cost of labour. Charges for management and the like had all to be paid in any case; and he looked upon it that everything between the price charged and the cost of manufacture alone was additional profit. By encouraging the demand for gas, they tended to reduce the price both for lighting and for heating purposes.

Mr. L. Hislop (Uddingston) said that in his place they charged a difference of 5d. per 1000 cubic feet, which they found to be sufficient. In a place like Glasgow, where they could afford to have a large staff of men to keep the cookers in repair and to clean them, it did very well; but he thought that in country towns the amount of trouble there was in keeping the stoves in order was really more than the value reaped from them. In his opinion most gas managers were beginning to admit this. On the other hand, gas-stoves gave them a very considerable extra consumption. They only put out stoves on the hire-purchase system, which he considered was best. As to Mr. Langlands' paper, he, too, had had the pleasure of being at the Earl's Court Exhibition; and he certainly agreed that the exhibits of lighting appliances were excellent. The systems of high-pressure lighting shown there certainly had a big field before them; and some of the streets in London which were lighted by them certainly had a very fine effect. With regard to the gas-making appliances, there was very little of importance, unless they took into account the De Brouwer machine and one or two others. In gas-engines there was a very good thing shown, in, he thought, the "National" gas-engine, in the process of firing by electric ignition, from which excellent results were being obtained.

Mr. G. Scott (Glasgow) considered that in Glasgow they were very far behind country towns in the matter of prepayment meters. He did not think they could muster 1000; and in his opinion a little more could be done. If they were to use more of these meters, it would be advantageous to poor people.

Mr. D. S. Munn (Dawsholm) said he was rather surprised to hear Mr. Hislop's heresies about gas-stoves. He thought it was generally accepted that they must do something with stoves, and that they were the salvation of the gas industry, because the consumption was going down unless they could get the gas-fire people or gas-engine people to use a little more gas.

Mr. J. Bell (Airdrie) said he should like to ask Mr. Hislop if he supplied stoves free. In Airdrie they did so in the case of slot meter consumers. This was partly the reason why the gas was so much dearer in that case than with the ordinary meters. Their results from slot meters and cookers were very good indeed. He had heard Mr. Vass say that he had invested about £200 in slot cookers, and that in the first quarter the returns had increased about £150. He (Mr. Bell) considered their mainstay in the future would be heating, including incandescent lighting. In Airdrie the price of gas was 2s. 11d. per 1000 cubic feet with ordinary meters, and 4s. 2d. with slot meters. The latter were very popular in Airdrie—1000 of them being in use.

Mr. J. Allan (Glasgow) remarked that in Glasgow they had a system of allowing discount to users of gas for power purposes only. He thought this was a mistake, because there were other large consumers—laundries and baking companies—who, in his opinion, were entitled to discount. Another thing which would be of advantage to the industry would be to do away entirely with the hire of gas-stoves, and either send them out free or allow consumers some reduction or consideration.

Mr. R. Shepherd (Glasgow) said he had no doubt there could be a great extension of the use of gas in Glasgow by the employment of prepayment meters, if, as Mr. Scott had suggested, the area in which they were given out was extended. It seemed that in Glasgow it was the undesirable section of the community who had got hold of these meters; but if they enlarged the area, he had no doubt they would gather in a respectable and paying class of consumer. He believed, with the rest of the speakers, that the future of the gas industry lay in the use of gas for heating and motive power. They were already getting an advantage from the heating movement; and if it were possible to reduce the price of gas by 2d. or 3d. per 1000 cubic feet, he had no doubt it would cause a great increase in the output.

The President said he was much surprised, like some of the speakers, to hear Mr. Hislop. If it had not been for the large ratio of increase in the use of gas for heating, cooking, and power purposes, he thought their output of gas would have shown a decrease. It seemed to him, looking back over a number of years, that the quantity of gas used in flat-flame burners had really fallen off in Glasgow, and that if they had not had a very much greater increase due to augmented consumption for other purposes, they could not have been in the position in which they found themselves to-day. The use of gas for these purposes had also a bearing upon the health of the community. The smoke problem was a serious one, and it was only by increasing the consumption of a smokeless fuel, such as a gaseous one, and decreasing the smoke from domestic and other chimneys, that improvement could be effected. Another point which might be considered in this relation was whether it was now necessary to make gas of the high candle power which was supplied for the most part in Scotland. It was rather surprising, when one looked to the quality of the gas supplied in the United Kingdom, to find that 40 per cent. of the entire bulk was of more than 16-candle power, and that gas supplied at and below this power was equivalent to 60 per cent. of the total used. Of the 40 per cent., only 13 per cent. was supplied at and above 20-candle power. If they took from

the 13 per cent. the consumption of gas in Glasgow, which was 20⅔ candles, and in Liverpool, which was of similar illuminating power, there was left only 6½ per cent. of the gas supply of the kingdom at or exceeding 20 candles; and most of this was in Scotland. Considering the great increase of lighting efficiency brought about by the incandescent mantle, the question arose as to whether it was necessary to supply gas of high illuminating value. Of course, they knew it was not necessary, or 60 per cent. of the entire bulk of gas would not be supplied of the low illuminating power. It might, however, be expedient, even if it were not at all necessary, where coal was available, and where a gas of 20 or 22 candle power could be made as cheaply as gas of 16 candles, as it might be in certain parts. But where enrichment was being used, which cost, on an average, ½d. per candle per 1000 cubic feet, this might be saved; and if the heating value of the gas was not decreased correspondingly, the consumer gained a very great advantage, due to the reduction in price that could be made. He thought the tendency was now, or would soon be, in most places where enrichment was employed, to dispense with it entirely. This, of course, would enable gas to be sold cheaper; and he was glad to hear from members as to the increased consumption which a cheaper fuel would bring about, because it was really fuel they were selling—it was not gas, but so many thermal units. He thought they were very glad to hear Mr. Mann voice his views on the reduced price which might be made on the day-load. This, of course, came into line with Mr. Allan's views as to discount. If a discount system were adopted, there must be a rational basis upon which to go. If a distributing system were not being used to its fullest extent during the day, and if they manufactured gas at 1s. or 1s. 1d. per 1000 cubic feet, and were selling it, through ordinary meters, at 2s. or 2s. 2d., it would still pay to encourage a day-load by selling at 1s. 6d. This would be 5d. over the 13d., which would be a clear profit to the gas department.

Mr. Orr, in reply, thanked the members for the manner in which they had received his paper. There were so many subjects he could have dealt with, and the time was so limited, that it was only one here and there that he could touch upon. The point he wished to emphasize more than any other was that the consumer of to-day reaped the advantage of the economy in manufacture and the benefit of increased consumption as well as the shareholders. At present they had in Motherwell 4200 ordinary consumers, and they charged 2s. 6d. per 1000 cubic feet. Theirs was a private undertaking. In 1884 they introduced slot meters, and now they had between 1400 and 1500 of them. The meters were set at 20 cubic feet for 1d., which was equal to 4s. 2d. per 1000 cubic feet. They collected 2s. 11d., and handed back to the consumer 1s. 3d. On the whole, the 5d. per 1000 cubic feet had paid them very well. He thought this was a fair margin for the extra cost of collection and the additional outlay for the meter. As to gas-stoves, they had always charged hire for them. He thought this was the most satisfactory method of dealing with them; because, in working-class communities, such as they had in Motherwell, they were rather afraid to provide gas-stoves nothing. It would not be becoming to have them standing in the corner.

Mr. Langlands surmised that in Motherwell the price had been fixed at 4s. 2d. when prepayment meters were introduced. He would like to bring to the notice of the members the little pamphlets on "Factories Without Chimneys," "The Cheapest Mode of Electric Lighting," "Gas Heating," and "Gas Cooking," which were distributed at the Earl's Court Exhibition; and he would like the Association to take up the question of buying a number of them and letting members have copies to read. They could then push the sale of gas. In these days they required to push, and he did not see why they should not all put their shoulders to the wheel. Mr. Allan's suggestion about differential rates was really a very good one, but it was rather difficult. His last experience was that where the consumption was more than 400,000 cubic feet in a year, they gave 10 per cent. discount. This was somewhat high. He would rather say that a consumer of 100,000 cubic feet should be entitled to a discount as well. In Glasgow they allowed discount only for gas consumed for power purposes. They all knew that in laundries, and in coffee-houses, where gas-boilers were kept going all day, and in engraving works, where it was used largely, the people did not reap any benefit from a large consumption; and he thought they should have some consideration. Mr. Bell had mentioned the subject of gas-stoves in Airdrie. He considered that if they earned £150 upon an outlay of £200, they had a very good return. In Glasgow, prepayment meters had been rather abused. They had been put into queer places. They were just now extending the area of supply of these meters, and were taking the districts one by one. Mr. Hislop had mentioned electric ignition in gas-engines. All producer-gas engines had this method of ignition, and no other. He was not entirely at one with Mr. Hislop on the question of stoves; still he thought he was right when he said that hire-purchase was the best way of sending them out, as the people had then something to work for. The stoves ultimately became their own, and consequently they kept them clean, which they would not do if the stoves did not belong to them. Still he would not like to sacrifice the whole consumption of gas they had in gas-stoves by compelling every customer to become a hire-purchaser. The question of how much should be charged in prepayment meters, over ordinary meters, was a difficult one. He always thought that about 9d. was sufficient. He was afraid 1s. 3d. was too high. The cost of collection would be easily covered by 9d. They could make a very good show, in a museum way, of articles which had been taken out of meters.

This closed the proceedings; and after the transaction of some formal business, the meeting was adjourned.

OXIDE PURIFICATION.

By E. H. Earnshaw, of Philadelphia.

[A Paper read before the American Gaslight Association.]

(*Continued from p.* 848.)

In the matter of the purification of water gas, our experience has not been quite so conclusive. We built and put in operation in March, 1903, a water-gas purifying-house, containing six boxes in tandem. We know that this arrangement has given us much better service than would have been obtained from the same number of bushels of oxide arranged in a four-box system; but, owing to the fact that we have no separate means of measuring the quantity of water gas purified by any one set of boxes, we cannot at this time make any definite comparison. We are now arranging to determine separately the amount of gas passing each set of boxes, and hope to have some definite data later on, as we expect to be able to use our experimental purifiers for the purpose. The gas will be tested at the outlet of the first box, and the boxes shifted in accordance with these tests until the duty and efficiency under these conditions are established. The efficiency with two and with three boxes in series will be determined by testing at the outlets of the second and third boxes respectively, and the work done by the oxide noted.

Temperature of Purification.—Purification is a purely chemical action, and it is a well-known fact that chemical reactions are promoted by heat. For this reason, it is desirable to keep the oxide reasonably warm. Probably the best temperature for purification is from 85° to 100°. If the oxide is too cold, it will not purify the gas.

Effect of Admitting Air for Continuous Revivification in Place.—There can be no question that by admitting air with the gas a very great increase can be obtained in the work performed by the oxide between the shifts. Under proper conditions, the oxide will take out several times the amount of sulphur theoretically possible without the use of air; in fact, the amount taken out seems to be only limited by the deposition of free sulphur ultimately causing back-pressure.

A batch of coal-gas oxide, already mentioned, took out 20·4 lbs. of sulphuretted hydrogen per bushel for one fouling—more than twice the theoretical amount without air; and the oxide was still doing excellent work when back-pressure necessitated taking it out of the box. The oxide was caked so hard that it was removed with great difficulty, even with the aid of picks. We have not found that the capacity of a given set of boxes is greatly increased by the use of air; but the duty of the oxide is greatly increased—that is to say, if the rate of flow is too rapid, the full benefit of the air is not obtained. While admitting the advantage to be obtained by the use of air in reducing the cost of purification, there has been a doubt in the minds of many managers whether the gain in purification cost is not more than set-off by loss in candle power. It always has been a difficult matter to get any accurate data on this point, owing to a change in conditions about the works, and the existence of a doubt as to whether the apparent gain or loss might not be due to some unnoted cause.

Loss of Candle Power Due to Admission of Air.—During the past year we have taken advantage of our experimental purifying plant to make some careful investigations into the loss of candle power due to admitting air to coal gas. Air was put in at the inlet of the condenser, and the gas from the outlet of the purifying boxes led to one end of the photometer-bar. Gas from the outlet of the exhauster, before the point of the admission of air, was cooled, passed through a test-light purifier, and led to the opposite end of the bar. Thus a direct comparison was had between gas with air admitted and a similar gas without the air. The supply of gas for the experimental plant being obtained from a single bench of nines, it was found that the candle power fluctuated widely between the periods of charging the retorts, so that single observations were of no value.

To overcome this, the plan was adopted of taking the comparative candle power observations every five minutes for a cycle of four hours, the average of all the readings being a true average comparison of the candle powers obtained. On one day a four-hour cycle of readings was made without the admission of air. Air was then admitted to the gas, and the next day (allowing time for conditions to become normal), a four-hour cycle of readings was made with air admitted. A comparison of the results obtained on two succeeding days was taken to represent the loss in candle power due to the admission of air. The results obtained are summarized below:—

Table VI.

Air Admitted. Per Cent.	Loss in Candle Power. Per Cent.	Air Admitted. Per Cent.	Loss in Candle Power. Per Cent.
1·0	2·2	1·5	2·4
1·1	2·4	1·6	3·0
1·2	2·4	1·8	3·5
1·3	2·3	2·0	4·2
1·4	2 4	2·2	5·2

The curve plotted from these figures is not at all regular, especially for the amounts of air less than 1½ per cent.; showing that the method we had adopted was not entirely reliable.

The experimental plant is equipped with two 50 cubic feet gas-holders, intended for taking samples of gas for candle power observations. During the experiments with the reversal of flow, admitting air to the inlet of the middle box, gas samples were taken in one holder from the outlet of the first box before the point of the admission of air, and in the other holder from the outlet of the last box, and, therefore, containing air. The holders were filled simultaneously, and the illuminating power of the gas contained in each determined against a pentane lamp. The candle power of the sample taken at the outlet of the first box being considered as that of the gas without air, the test of the sample in the second holder, taken from the outlet of the purifiers, showed the effect of the admission of the air. This method proved very satisfactory, and consistent results were obtained, a summary of which is given in Table VII.

TABLE VII.

Air Admitted. Per Cent.	Loss in Candle Power. Per Cent.	Air Admitted. Per Cent.	Loss in Candle Power. Per Cent.
1·0	2·0	1·9	3·6
1·2	2·3	2·1	3 9
1·4	2·6	2·3	4·3
1·6	3·0	2 5	4·8

The curve plotted from these determinations is very regular and nearly a straight line. It is apparent from the figures that the question of whether or not it pays to use air for revivification is a matter to be determined by local conditions, such as the cost of gas and purification, and, where the necessity for high candle power exists, also the cost of enrichment to make up the loss in candle power. Owing to increase in volume due to the air, a loss of 4 per cent. in candle power by the admission of 2 per cent. of air becomes a net loss of 2 per cent. in candle-feet.

Effect of Air on the Efficiency of the Oxide.—The following experiments were made with our testing plant to determine the efficiency of the oxide when admitting air with the gas. The boxes having been filled with oxide from the reserved stock, coal gas was passed through them at the rate of 4000 cubic feet per hour, corresponding to a factor of 0·5. Air was admitted to the gas at the condenser inlet at the rate of 2 per cent. by volume; this being approximately double the theoretical quantity of air necessary for complete revivification. The gas at the inlet to the purifiers contained about 250 grains of sulphuretted hydrogen per 100 cubic feet, and 1 per cent. of air is theoretically required for each 250 grains.

TABLE VIII.

Oxide Batch.	Pounds Sulphur Taken Out per Bushel.	Cubic Feet Purified per Bushel.	Efficiency. Per Cent.
No. 12	4·35	10,184	37·1
,, 13	3·92	11,339	33·5
,, 14	5·02	12,775	42·8
,, 15	4·40	12,896	37·6
Average	4·45	11,799	38·0

This shows a very marked improvement as compared with the results obtained by the same rate of flow without air (see Table IV.). Nevertheless, the comparison does not do justice to the advantage gained by the admission of air, because the condensing facilities in the experimental plant were inadequate, and we found tar being carried over into the boxes in quantities sufficient to interfere with the accuracy of the results. Batches Nos. 13 and 15 were shifted before the gas showed foul at the outlet, because of back-pressure caused by tar. It had been our intention to investigate further the effect of air in varying quantities and with different rates of flow; but at this point the experimental plant was shut down and the experiment temporarily abandoned in order to permit the installation of a small condenser and a Pelouze and Audouin tar extractor in the retort-house; the idea being to partially cool the gas and remove the tar before starting on its journey through the several hundred feet of pipe separating the experimental plant from the house. This pipe drained into a well in the experimental plant, so that the gas travelled and became cooled to about 90° Fahr. in contact with the tar. We found that not only were the purification experiments interfered with by tar, but the candle power of the gas suffered deterioration; rendering the installation unsuitable for its original purpose—that of testing gas coal. It is interesting to note that the measures taken to remedy the trouble have been entirely successful, and we are no longer troubled with tar or with loss in candle power.

Effect of Air with Reversal of Flow.—The boxes of the experimental plant are arranged so that the direction of the flow of gas through them may be reversed; that is to say, the reversing connections are made at the inlet and outlet of the centre-seal, so that the direction of flow is reversed in each box and the sequence of the boxes changed. This arrangement was made to enable us to study the effect of reversing the flow of gas in the presence of air, and to make a comparison of the efficiency of this method with the efficiency obtained by continuous revivification without reversal of flow.

The results encountered were so unexpected that it will be of interest to present them here somewhat in detail. With coal gas passing through the boxes at the rate of 5000 cubic feet per hour, tests made at the outlet of each box showed as follows:—

	Grains H_2S per 100 Cubic Feet.
Inlet to purifiers	240
Outlet of 1st box A	20
,, 2nd ,, B	8
,, 3rd ,, C	0

The following tests were made after reversing the direction of the flow of gas, the figures representing the number of grains of sulphuretted hydrogen per 100 cubic feet:—

	24 Hours after Reversal.	50 Hours after Reversal.	67 Hours after Reversal.	98 Hours after Reversal.
Inlet to purifiers	260	270	270	520
Outlet of 1st box A	4	15	16	17
,, 2nd ,, B	9	8	6	12
,, 3rd ,, C	35	33	15	10

After 96 hours, the flow of gas was again reversed, being restored to its original direction; and a test taken two hours later shows as follows:—

	Grains H_2S per 100 Cubic Feet.
Inlet to purifiers	570
Outlet to 1st box A	60
,, 2nd ,, B	12
,, 3rd ,, C	72

These reversals have been without the admission of air. Air was now admitted to the inlet-box at the rate of 2 per cent., and 16 hours later the following test was made:—

Inlet to purifiers	340
Outlet of 1st box A	50
,, 2nd ,, B.	10
,, 3rd ,, C.	20

This test ended the experiment temporarily, as it was evident that the gas was not going to clear itself; and we were somewhat at a loss to account for the phenomenon.

The failure of the gas to become clear of sulphuretted hydrogen was very perplexing; and it was thought that better results might be obtained by admitting the air for revivification at a point where the gas was comparatively free from sulphuretted hydrogen. Acting on this idea, another set of experiments was begun, admitting 2 per cent. of air to the inlet of the last box in series after the reversal of flow; that is to say, to the box which had just been fouled. The tests were taken on the 7th of July, at 2 p.m., and the results obtained were as follows:—

Inlet to purifiers	520
Outlet of 1st box A	130
,, 2nd ,, B.	11
,, 3rd ,, C.	Trace.

At 2.45 p.m. the flow of gas was reversed, and 2 per cent. of air admitted into the gas at the inlet of the last box—in this case to box A. Tests taken at 4 p.m. were as follows:—

Inlet to purifiers	520
Outlet of 1st box C.	12
,, ,, 2nd ,, B.	15
,, ,, 3rd ,, A.	68

Subsequent tests (the second set at 2 p.m., the rest at 9 a.m.) were as follows:—

Inlet to purifiers	520	520	370	380	370
Outlet of 1st box C	6	15	30	60	80
,, ,, 2nd ,, B	8	10	0	0	5
,, ,, 3rd ,, A	15	11	5	4	0

The gas was passed through the boxes at the rate of 5000 cubic feet per hour, and the gas remained clean at the outlet of the last box for nine days, until July 20, when the following test was taken at 9 a.m.:—

Inlet to purifiers	300
Outlet of 1st box C.	150
,, ,, 2nd ,, B.	30
,, ,, 3rd ,, A.	Trace

The flow of gas was again reversed, and the air admitted to the inlet of the last box after reversal (box C). The following tests were taken each day at 9 a.m.:—

Inlet to purifiers	320	300	260	400	300	270	320	290	270
Outlets—									
1st box A	18	65	90	120	120	110	130	120	140
2nd ,, B	16	6	4	20	21	8	19	15	20
3rd ,, C	25	9	7	4	7	1	2	3	5

It was evident at this point that the amount of sulphuretted hydrogen at the outlet of the last box was increasing, and that there would be no further clearing up; so a shift was made and a fresh box brought into service. This time 2 per cent. of air was admitted at the inlet of the middle box. The gas remained clean at the outlet of the last box for 12 days, until Aug. 9, when the following test was taken:—

Inlet to purifiers	410
Outlet of 1st box B.	175
,, ,, 2nd ,, C.	30
,, ,, 3rd ,, D.	Trace

The direction of flow was then reversed and the following tests made, air being admitted to the inlet of the middle box:—

Inlet to purifiers	420	420	450	410	410	420	380	390	320	300
Outlets—										
1st box D	30	40	50	55	85	105	200	205	240	240
2nd ,, C	10	10	15	15	15	20	20	20	50	50
3rd ,, B	60	30	15	15	10	10	10	8	10	12

On Aug. 20 the gas still showed foul at the outlet of the last box, so box D was put off, and a new batch of oxide put on in box A. The point of admission of air was changed to the inlet of the first box in the series (box B). The gas remained clean for only four days; so that on Aug. 23 the flow was again reversed—air being admitted to the inlet of the first box (A). At this time the coal being used in the retorts contained very little sulphur, so that the sulphuretted hydrogen in the crude gas was quite low, and the fresh oxide in box A took out all but a small quantity. Under these conditions the sulphuretted hydrogen in the outlet gas diminished gradually, and eight days after the reversal of flow the gas was clean.

Inlet to purifiers	280	255	220	210	275	250	260	250	260	
Outlets—										
1st box A	10	20	10	15	20	25	35	40	60	
2nd ,, B	5	5	5	5	10	10	15	10	15	
3rd ,, C	10	5	5	4	5	4	Trace	Trace	0	

The gas remained clean at the outlet of the last box for six days. On Sept. 6 the gas showed 10 grains of sulphuretted hydrogen passing the last box; so at 11 a.m. the flow was reversed, and 2 per cent. of air admitted to the inlet of the first box (box C). The following tests were made at 9 a.m. on succeeding days:—

Inlet to purifiers	270	..	290
Outlet of 1st box C	15	..	15
,, ,, 2nd ,, D	10	..	10
,, ,, 3rd ,, A	45	..	40

During the night of Sept. 8, a stoppage occurred in the 8-inch pipe from the hydraulic main to the tar extractor. The seal was broken on the latter, and air was drawn in in sufficient quantity to overheat and ruin the oxide in box C, bed No. 22. The oxide in the other boxes, while not ruined for further use, was partially revivified by the excess air, so that it was necessary to abandon the experiment.

While it was unfortunate that we were unable to determine whether bed No. 22 would again clear up, enough was accomplished to show that reversal of flow adds materially to the duty of the oxide between shifts. It is true that much of the time the gas showed sulphuretted hydrogen at the outlet of the boxes; but the actual quantity passing was small, and would give but little duty on a catch-box system following the regular system. Bed No. 20, which was in the inlet-box at the beginning of this experiment on July 8, took up 3·83 lbs. of sulphur per bushel between that date and July 28, when it was finally taken off. Bed No. 21, which was started in the second box, took out 8·2 lbs. of sulphur per bushel before it was taken off on Aug. 19. Bed No. 22, which was in the last box at the beginning of this experiment, took out 11 lbs. of sulphur per bushel.

Comparing the results obtained by admitting 2 per cent. of air and shifting by test at the outlet of the third box in the regular way, we get the following figures:—

Oxide Batch.	Pounds of Sulphur per Bushel.		Approximate Cubic Feet per Bushel.		Efficiency. Per Cent.
Average, Table VIII.	4·45	..	11,799	..	38·0
No. 20 (reversal)	3·83	..	11,500	..	32·7
No. 21 ,,	8·00	..	15,000	..	68·4
No. 22 ,,	11·00	..	22,500	..	94·0

This comparison would make a better show for shifting in the regular way, if the gas at the outlet of the last box were allowed to become as foul as in the case of reversal; but it seems clear that an advantage would still remain with the reversal system.

Cost of Installation.—In many works the interest and depreciation in the cost of the installation of the purifying plant amount to a greater sum annually than the total operating purification cost of labour and materials. The main thought, therefore, suggested by these incomplete investigations is that the cost of installation for a given capacity may be very greatly reduced compared with amounts we have been accustomed to spend for this purpose.

We have shown that in a tandem set of six boxes the first three do nearly all the work, but that the remaining three are necessary to complete the purification of the gas. It seems evident, therefore, that the greatest economy can be secured by providing a certain number of boxes, equipped for easy and economical handling of the purification material. They should be provided with ample gas connections, and with seals deep enough to withstand considerable pressure. It is probable that advantage will be secured by a centre-seal arrangement which would permit the reversal of the direction of flow of the gas through the boxes. No effort would be made to keep the gas clean at the outlet of these boxes; but a catch-box system would be provided of ample capacity to remove the comparatively small but refractory last traces of sulphuretted hydrogen. These catch-boxes would seldom require refilling, and would, therefore, be of inexpensive construction, without regard to economy in handling material. They might preferably be placed in the ground, perhaps in some out-of-the-way corner of the works; and it is doubtful whether there would be any necessity for protecting them with a building. Such an installation would be very efficient, and, considering its capacity, comparatively inexpensive.

In conclusion, I may say that, though delayed in our experiments, we have by no means abandoned expectations of ultimately obtaining some definite data; and it is our hope that the account of what we are attempting to discover may stimulate investigation by others, and thus afford additional and, we trust, corroborative evidence.

INCANDESCENT BURNER ADJUNCTS.

In the making of accessories tending to produce some advantage in incandescent gas-burners, there is no end. The exhibition number of the "JOURNAL" contained a description (on p. 584) of the "Eureka" incandescent gas-burner, which the inventor (Mr. Marquis Bibbero) is about to re-name the "Invicta;" but its special feature may be more clearly explained now that we have had samples of the burner submitted for inspection.

As to the top and stem of the burner, they are of the ordinary pattern; but it is in the method by which the inventor secures the regulation of the air supply, and at the same time protects the air-inlets from draughts, and prevents the admission of dust and other floating particles that there may be in a room, that the novelty is found. Around the stem of the burner is a cone-shaped fitting with its apex towards the bottom of the burner, and its open base extending nearly up to the chimney holder that surrounds the burner top—much in the same way that the ornamental sheath is placed for beautifying purposes around the Kern burner. But in the case of this cone, there are no inlets in the sides. Over the top of the stem of the burner, and fitting into the open part of the cone-shield, is a cup-shaped cap with bevelled edge, the upper part of which edge is larger in circumference than the top edge of the cone below. Now the junction between these two can be opened and closed at will, and the annular space formed supplies the entrance for the air, which passes down to the air-inlets in the foot of the burner stem. It follows that the wider the annular space is opened, the greater the quantity of air passing to the air-inlets; the closer the two parts are brought, the smaller the ingress of air. The regulation of the size of the air-admission opening is performed at the foot of the burner. A small fitting is supplied there, on to the larger part of which the outer cone screws, while the burner stem is screwed on to the top of the same fitting. The air admission is therefore simply regulated by the screwing of the cone up or down on this fitting to any degree required to secure the best mixture of gas and air for realizing the maximum illumination. When this point has been attained, the cone is locked in position by a milled nut on the fitting at the base of the burner. The tray-shaped cover at the top and the cone itself both serve to intercept dust or other floating matter and, as already stated, effectually prevent any ill-effects from disturbing draughts. The inventor has also designed a gas-regulating nipple, which he is about to apply to the burners. In the new forms of the burner, the cone and top plate are going to be cast, and not stamped. Arrangements have been made for the sale of the burner by Messrs. Falk, Stadelmann, and Co., Limited.

In conjunction with the burner, the inventor is, where flash-lights are required, advocating the use of Breeden's patent bye-pass tap, which allows sufficient gas to pass to form, when the burner is not in use, a small bunsen flame inside the mantle, instead of the white flame of the ordinary bye-pass jet. This tap forms the elbow carrying the burner. Supposing this depicts the elbow ⅃, then the longer bottom part screws on to the bracket in place of the ordinary elbow; and the vertical part carries the burner. Between the gas-inlet side and to nearly the top of the vertical stem, there is drilled a channel for the passage of the gas for feeding the bye-pass flame; the passage of the gas for the ordinary flame, of course, flowing up the centre of the elbow in the usual way. In the outer, or shorter, branch of the elbow at the bottom, there runs a small rod carrying a plug on its inner end, and a knob at the other; this part being kept in position, and a gas-tight joint made, by a nut screwing into the elbow. The simple act of pulling out by the knob this small rod, or pushing it home, lights or extinguishes the burner. When the rod is pressed in, no gas can flow excepting to maintain the small blue flame playing round the cap of the burner; when the rod is pulled out, the passage is fully opened to the flow of the gas for lighting purposes.

THE WATER SUPPLY OF PENZANCE.

By FRANK LATHAM, Borough Engineer of Penzance.

[Abstract of a Paper read before the British Association of Water-Works Engineers, Dec. 10.]

Until recent years the town of Penzance was entirely supplied with moorland water, by gravitation, from two open reservoirs of 12 million gallons joint capacity. A few years ago, owing to improved sanitation and increased population, this storage became insufficient to meet the full requirements of a constant supply; and it was found necessary to supplement the works accordingly. During the winter months the reservoirs are well replenished with water, the quantity collected from the moorlands and conveyed into them being abundant, and more than 50 per cent. in excess of the consumption so long as the average winter rainfall lasts. But as soon as this decreases—that is, from the end of May—the reserve is drawn upon.

In order to augment the supply during the four or five months of drought, pumping from a new well has been resorted to for the past three years. Pumping is limited to the periods when the supply of moorland water is insufficient; so that the cost of pumping is not continuous throughout the year. The water obtained from the well is much appreciated during the summer months on account of its low temperature.

During the first year of the new well being used, the water thus obtained was mixed with the moorland water in the uncovered reservoirs, which, by the middle of the summer, contained more well water than moorland water. This well water, being now exposed to the action of the sun, favoured an abundant growth of objectionable green weeds of considerable length; and during the summer of 1902, the amount far exceeded anything of the same character seen in previous years, when mainly moorland water had been stored. These weeds give a flat taste to the water, decompose rapidly, and clog the filters. When the quantity of well water was but small compared with the quantity of moorland water, the water stored in the reservoirs was found to remain pure and free from large growths of weeds for a much longer period. As regards chemical purity, the well water is far better for drinking and domestic purposes than the moorland water, but whether owing to its hardness or the presence of carbonic acid, or some other cause, the growth of vegetation develops to a remarkable degree directly it is exposed to sunshine.

A scheme has now been carried out which answers the twofold purpose of preventing the growth of weeds and giving additional water pressure to the higher portion of the town. For this purpose a covered service reservoir has been built at a higher altitude than the existing reservoirs; and the water from the well is pumped into this, and not allowed to mix with the moorland water in the larger open reservoirs. The mains in the town have now been divided into two systems or districts—each having a separate supply main, one connected to the open reservoirs containing the moorland water, and the other connected directly to the high-level covered service reservoir containing the well water.

Seeing that the pumping operations are suspended during the winter months, some arrangement was necessary for continuing the higher pressure requisite for the upper district during that period. This was effected by close piping the stream which conveys the moorland water to the reservoirs; the pipes, which were of cast iron, being laid far enough up the stream to obtain a sufficient head for feeding the high-level reservoir. By means of suitable valves, the supply from the stream during the winter can all be turned through the high-level reservoir; and by means of an overflow pipe, all water in excess of that required for the use of the higher district is run into the open storage reservoirs, whence it goes to supply the lower portion of the town. The close piping of the stream has also done much to protect the water from possible pollution arising from dwellings and farms in close proximity to that portion of the stream; this advantage alone justifying the outlay involved.

The materials in general use for service-pipes are lead and iron. Lead pipes possess such advantages over iron that they should be adopted in towns where the character of the water will permit. With very soft water, practically devoid of lime, lead pipes should never be used; but there appears to be nothing against their employment for water containing 4 grains and upwards of lime per gallon, either in the form of carbonates or sulphates. These conclusions are drawn from the author's observations of the action upon lead of several different characters of water; and it is clear that water containing a small quantity of lime causes a deposit upon the surface of the lead pipe, which effectually protects the metal from the solvent action of either carbonic acid or oxygen.

The stop-taps on all service-pipes should be of the best design and quality, placed in such positions as to be under the control of the waste-water inspector. The author still prefers the old plain tumbler tap, not having yet met with any modern screw-down stop-tap less liable to get out of order. In many places the tumbler tap has been discarded for years for screw-down taps with washers and comparatively slender spindles. The tumbler tap has a spindle of great strength; and even after remaining disused and surrounded by grit and damp for a lengthy period, the plug is always readily turned when required—leakages with this description of tap being almost unknown. Over 3000 tumbler taps, and also many screw-down taps, are in use under the author's control; and he finds that careless users, armed with a pair of pincers, frequently wrench off the ears from the screw-down taps. In some makes of taps the washers require a good deal of attention; and it is not rare to find a portion of an old washer in the service-pipe, which has thereby become choked.

The concluding part of the paper was devoted to a consideration of the selection of reservoir sites in Cornwall in view of the difficulties due to the geological formation of the locality. In the final paragraph, the question of the choking of artesian wells was dealt with. The author has experienced considerable trouble in keeping artesian tube wells clear after driving; the loose sandy material overlying the granite having a tendency to silt up the tube, and prevent the full flow of water, as is sometimes found to be the case in wells driven through sandy soil. He has found that, by using a tube of small diameter, having its bottom end turned up or U shaped, this trouble can be overcome. This tube is lowered to the bottom of the well until the upturned bend embeds itself in the deposit to be removed; and then, by means of a compressor attached to the head of the tube, and of sufficient power to overcome the water pressure, air is forced down the tube, the deposit disturbed, and, being then forced up, is carried away in the water. Should this method be tried by other engineers, the author would like to learn the results.

Discussion.

In the absence of Mr. Latham, the paper was read by the SECRETARY (Mr. Percy Griffith), who, before the discussion proceeded, also read a letter that had been sent to him by the author. In this, Mr. Latham said that, where he referred in his paper to the water stored in the Penzance reservoirs as consisting mostly of stream water collected from the moorlands during the wet season of the year, he should have mentioned, to be quite accurate, that one-twelfth of the average winter flow of the stream was spring water, the outcrop of which was at Lanyon, where there was an opening from an old mine level. From this point, the spring water united with the moorland water in an open stream, and flowed for a distance of 4 miles previous to being piped into the reservoirs. The water as it flowed down in this stream became well aërated; provision having been made for it to pass over weirs in its course, one of which was formed in steps to the height of several feet. Another feature of unquestionable advantage as regards quality, was that previous to the stream passing over the raised stepped weir, it flowed into two ornamental lakes, which acted as settling-basins; thereby intercepting substances contained in suspension in the water. With further reference to the effect of water on lead, the author forwarded some samples of lead pipes. Alluding to them, he said that the water in connection with which these pipes had been used contained 4·5 grains of calcium carbonate per gallon, which constituted practically its total hardness. There were among the samples lead pipes which had been in constant use for thirty years; others, for a period of twenty years. There was also one sample submitted which had been in use for four years only. The internal surface was well coated in each instance with lime deposit, which had effectually protected the lead; thereby preventing any injurious effects arising from the action of the water upon it. Over the lime there was a second deposit, evidently the result of peat. What he particularly desired to draw attention to was the fact that the pipes which had been in use for thirty years were not corroded to a greater perceptible extent than were either of those which had done duty for twenty years or for four years only. In this case, the condition in which the pipes were found when removed demonstrated that the coating as the result of the calcium carbonate contained in the water did not continue to accumulate after the internal surface was perfectly covered. He thought that lead-lined cisterns and even pipes, when they were new, might be a source of danger to health, with most qualities of water, unless artificial means were employed to protect the metal. Mr. Griffith also read the following telegram from Mr. Henry Carne, the Chairman of the Penzance Water Committee: "Permit me to say we have tumbler stop-taps good condition after forty years' use. No other form with rubber has lasted more than ten. Our water has no effect on brass."

Dr. KEMNA (Antwerp) said this was an extremely interesting experience of what might happen, when all things had been considered; but one item lying a little outside of the ordinary practice of engineers had been omitted. Here they had practically a dual supply—one of which was surface moorland water, taken from a stream running into two ornamental ponds where the water was purified by decantation, and the other taken from a series of wells more or less deep. So that there were two kinds of very different waters; and they saw that the population had a very great liking to the supply from the deep wells, on account of the temperature and the better taste owing to the lime. Now how would any reasonable manager work such a dual supply? It would certainly be by taking as much as possible from the underground supply, in which case he would be dealing with a purified and more palatable water of equable temperature, and only taking the quantity required to make up the necessary amount from the surface water. He did not think this was what was done here; but it was a question of cost. Leaving aside this question, however, the method of procedure that he had referred to as being the best was the one to adopt. With moorland water, they had a great deal of organic matter in it, which it might be supposed

would force growth. Well, it did not, because the amount of growth capable of springing up in that water was limited by the amount of the mineral constituents, which were necessary to make up any organism. On the other side, they had a well water which contained very little organic matter, but a larger amount of metallic salts. Here the growth of organisms was limited by the small amount of organic matter. But if the two waters were joined, they had a large amount of organic matter and metallic salts; and so they had an admirable growth of all kinds of things. They had two waters, one of which contained in abundance one of the elements essential to force the growth; but it did not contain the other. By mixing with it a water containing the other, they had a great amount of growth, and complaints from the population of the bitterness of the water.

Mr. W. Whitaker remarked that it was all very fine to say the place was supplied with moorland water. It would be better to show where it came from. This would be more interesting. The same in regard to other papers. When speaking of a well, it would be far better to give information as to its depth.

Mr. C. E. Jones (Leyton) said he thought there must be some local peculiarity in this water to take it out of the ordinary category of experience of engineers; and after Dr. Kemna's explanation, he saw it with a great deal more clearness than before. On the question of distribution, he would say a word or two as to his own experience. There was no doubt a material was wanted for water-service pipes which would be of all-round application. They did not appear to have discovered such a material yet; and the most useful metal that was employed for the purpose was lead. Soft waters, they were aware, had the power of dissolving lead, and taking it forward into the dwellings, where it was used by the individuals. Lead being a cumulative poison, it accumulated in the system, and eventually caused death. He had had a lot of experience in his time with soft water; and he had never found a water with 4° of hardness that had any action on lead. If they could satisfactorily coat the inside of lead pipes with some substance such as tin (it was sometimes attempted with more or less success), they would have an ideal material for the conveyance of water after it was filtered. Iron service-pipes, so far as he had used them, he found, were always subjected to corrosion. They were in a happy state where they could run, as at Penzance, such a number of iron pipes for so long a period without inconvenience. It was also very refreshing in these days to hear a word in favour of the old plug-tap. He thought it had died a natural death a long while ago; but it appeared to have been resuscitated. They found that here again Penzance was peculiarly situated; and their friends there ought to be congratulated upon their exceptional position and experience. He did not suppose there were many water undertakings in this country having any pretensions to being up-to-date that employed plug-taps. He himself discarded them forty years ago; and he should not think of putting one in now.

Mr. C. Sainty (Windsor) pointed out that, if the specimen of tap the author had sent was what he described as a "tumbler" tap, then all he (Mr. Sainty) could say was that it was simply the ordinary plug-cock, which was used for years, but discarded long ago.

Mr. T. N. Ritson (Ramsgate), examining the tap, said it was called a plug-stop tap, and it was one.

Mr. W. Watts (Sheffield) said Mr. Jones had stated that he was not aware of any action on lead piping by water with above 4° of hardness. A great deal depended on the acidity of the water. Water coming essentially from peaty moorland districts, and containing a great deal of acid, might be very soft, but it was the acid that acted upon the lead pipe.

Mr. H. E. Stilgoe (Dover) remarked that the question of the material of which service-pipes were composed raised a point in his mind which had no doubt occurred to many others. The water in his district of Dover was hard chalk water; and they had had considerable trouble recently with lead service-pipes. Their neighbours, with practically the same water, used galvanized iron service-pipes, while in Dover they used lead piping. It did appear to him that the time had come, in the manufacture of lead pipes, when there should be some different specification than the weight per foot. Some of the lead pipes in their district which had been coming out lately had been heavy lead service-piping, and to all appearances, when it was put in, was as good as any other; but in about four or five years, it had become pitted with pin-holes like some of the lighter pipe. He took it that this was due to the fact of so much of the silver being extracted from the lead. He found that, while they could with the heavy lead pipes of some few years ago even tie them into knots and do all sorts of things with them, the present lead pipes made by some makers (he was not putting them all in the same category) would not stand the wear that the older qualities did. It would be of great assistance to everyone using lead pipes for water supplies if a standard could be arranged as to the weight of the lead.

Mr. Jones, supplementing his former remarks, said Mr. Watts was like Thomas—a doubter. He (Mr. Jones) had exposed lead pipes to all kinds of water for over fourteen days, and with not less than 4° of hardness, it had not taken up lead. Some moorland waters were very destructive; but if lime was present in any quantity, there was no action in his experience.

Mr. Ritson (returning to the question of the plug-tap) said he took it that it was simply used as a stop-tap on the service; and for this purpose he believed that type of tap was in use in many towns in the country. Having only to be turned off at long intervals, it was probable a tap like this might have advantages over the ordinary screw-down taps. This appeared to be the purpose for which it was used at Penzance.

Mr. R. Askwith (Bishop Auckland) stated that at one works, of which he had control for above 35 years, he used nothing but screw-down taps; but eight years ago he was called in to undertake the prevention of waste at Newcastle and Gateshead, where there was a population of a little more than half-a-million. He found that there the plug-tap was used entirely as a stop-tap to the houses. His first impulse was to drive out this plug-tap; but the information given to him, and the particulars as to the state of the taps, made him decide to give the poor plug-tap a chance. He was able to say he was not sorry he did so. His advice was, where they had one class of tap in a town, not to alter it, and not to mix the two.

Mr. Easton Devonshire said the question of the "stop-cock" or "plug-tap" raised a most important and interesting point as to nomenclature, especially in view of the regulations now being drawn up by the Joint Committee, on Sub-Committee B of which he had been appointed. They were talking here of "stop-taps" and "plug-taps." Plug-taps might not necessarily mean anything; but a stop-tap necessarily meant an instrument by which the supply was cut off in a length of pipe. Now he found, in many Acts of Parliament and in the Water-Works Clauses Acts, the term "stop-cock" was always employed; and he thought it was rather an important matter, now that they were going into the question of regulations, that they should make up their minds as to what was the right thing. In regard to the tumbler tap, he did not know what it was. In his own experience, they might use a plug-cock for shutting off if it was solely under their own control; but, with high-pressure supply, he should be frightened to let anyone else touch it. As to the lead-pipe question, Mr. Stilgoe raised a point that should be considered by the Joint Committee. He quite agreed that there should be a specification of the quality of the lead used in pipes.

OBITUARY.

The death took place last Saturday week, after a lingering illness, of Mr. F. G. Rowe, one of the best-known public men of Filey. Deceased was for a number of years a member of the Urban District Council; but when that body took over the undertakings of the Gas and Water Company (of which he was Secretary), he entered the service of the Council as Collector.

It is with much regret that we chronicle the untimely death of Mr. David P. Young, of Edinburgh, who was long and intimately connected with the gas profession. Coming home from business one day, his foot slipped on the stair leading to his house, with the result that he was precipitated to the landing and died shortly afterwards. For some time he had been engaged in the fruit trade in Edinburgh; but previously he was Manager of the Dalkeith Gas-Works for a considerable time. In that town he is still remembered by many friends. Mr. Young belonged to a family well known and highly respected in the gas world. He was a son of Mr. John Young, Gas Engineer; and his eldest brother is Mr. W. Young, of Peebles. The deceased leaves a widow and four children, for whom general sympathy is felt.

Nanterre v. Aalborg Conveyors.—With reference to this subject, Mr. Maurice Graham says that, owing to the "Journal" going to press so early this week, he is unable to respond in this number, with the completeness that is necessary, to the letter which appeared last week over the signature of "F. D. Marshall." The matter, however, is receiving his attention; and a communication will be forwarded in time for our next issue.

Calorific Value of Different Fuels.—In a paper recently published in the "Revue Technique," M. Levi makes the following comparison between the calorific values of different fuels used in internal combustion engines (in British thermal units per pound): Methylated alcohol, 10,620; methylated alcohol mixed with 50 per cent. of gasoline, 14,200; crude American oil, 19,630; refined American oil, 19,880. The mixture of methylated alcohol can, it is stated, be used as easily as ordinary gasoline; but with unmixed gasoline it is necessary to warm up the carburettor a little before starting, as the alcohol does not vaporize readily enough below a temperature of 68° Fahr.

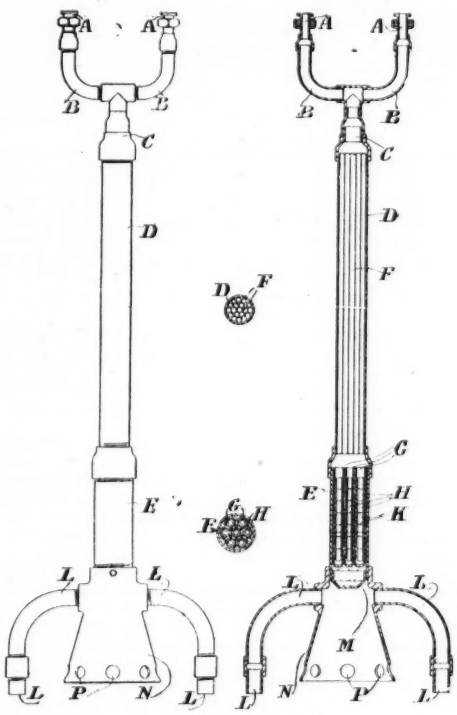
The Recent Failure of the Electric Light at Bradford.—Our contemporary the "Electrician" says on this subject: "We are confirmed in our view that the mishap at Bradford was chiefly due to serious faults of long standing in the design of the network, by the City Electrical Engineer's report. During Mr. Blackman's short occupancy of his present position, he has had to deal with a continuous series of troubles, those at the generating station having been of almost equal importance to those on the network. An investigation into the state of the network had just been concluded before the disaster, and this examination had been greatly retarded by the absence of proper plans and data concerning the position of the mains, and lack of system in the method of joining them up

REGISTER OF PATENTS.

Burners for Burning under Water or other Liquids.—Smethurst, W., of Dolgelly. No. 25,748; Nov. 25, 1903.

This invention relates to burners in which intimate mixtures of combustible and combustion-supporting gases are burnt, submerged under water or other liquids. It has for its object the prevention of the firing-back of the combustible mixture within the supply tubes or chambers, and the effective circulation of the submerging water or liquid about or through the nozzle of the burner, so as to prevent back-shots of the liquid against the gas-nipples, and the deposit of crystals or fur within the nozzle of the burner, or upon the nipples of the burners.

The improvements consist, in the first place, in providing in the upper part of the neck of the burner a series of nests of tubes, reducing in diameter from the burner towards the gas supply, and through which the gas passes in succession towards the nozzle of the burner. This arrangement is to ensure the prevention of the gas firing-back towards the source of supply. In the second place, they consist in introducing the liquid or water in which the burner is submerged towards the flame of the burner by induction, somewhat after the fashion of an injector, in order that the liquid evaporated into steam by contact with the flame of the burner may continually and quickly pass away from the burner with the gases of combustion and steam, and a fresh supply of liquid may be continually induced to follow such flow by suitable induction inlets at or about the rear of the burner-nozzle. This, it is said, prevents conflict between the out-going products of combustion and steam and the inflowing fresh supply of liquid—thus preventing return-shock, tending to back-firing, and, further, by the scouring action of the circulation through the burner always in an outward direction, preventing the deposit of crystals or fur, and the resulting caking-up of the burner.



The illustration shows an outside elevation of the burner, and a vertical section of it; also transverse sections.

The supply of inflammable mixture is supplied to the burner by divided pipes A, which are of small diameter compared with successively increasing areas of successive pipes and the burner-tubes. Where the inlet-pipes are 1 inch in diameter, they increase at B to $1\frac{1}{4}$ inches. This is increased at the uniting pipe C to 2 inches, with further increases in the pipes to 3 inches at D and 4 inches at E respectively. The burner-pipe D is filled with tubes F of an internal diameter of not more than $\frac{1}{2}$ inch, and about 3 feet in length. The next ensuing burner-pipe E is filled with tubes G of 1 inch internal diameter, in which are placed short pieces of tube H of smaller diameter, between each of which is a transverse sheet of gauze K of about 30 meshes to the inch. The lower ends of the tubes G are coned or bent inwards to contract the flame and increase its velocity past the mouths of the side induction pipes L. The mouths of the tubes G are also protected by gauze. "It is found that the above relative dimensions are of importance—particularly the small diameter of the tubes F, and their length, to prevent the firing-back of the inflammable mixture."

Around the orifices of the tubes G is arranged a cone M, which is adjustable vertically by screw threads in the interior of the pipe E. This cone further concentrating the issuing flame which begins to burn at the orifices of the tubes G, forms an induction nozzle past the side induction pipes L, through which is thereby induced a flow of the surrounding water or liquid towards the issuing flame. The liquid is thus brought into intimate contact with the flame "just at its nascent point of combustion;" and the combined flame and liquid issues downwards in a forcible stream through the expanding trumpet-mouth N, provided with apertures P about the lower rim for the lateral spread of the boiling liquid.

The side induction pipes L (which are adjustable as to length) must have their lower orifices L brought down below the level of the trumpet-edge to ensure a perfect circulation. "The circulation of the boiling liquid thus set up in the trumpet-orifice of the burner always in the same direction, following and induced by the issuing flame, prevents any return shocks of liquid against the burner with tendency to back-fire, and further prevents all deposit of fur or crystals upon the operative parts of the burner; while at the same time the constant regular circulation of colder liquid towards the flame increases the evaporative efficiency of the burner."

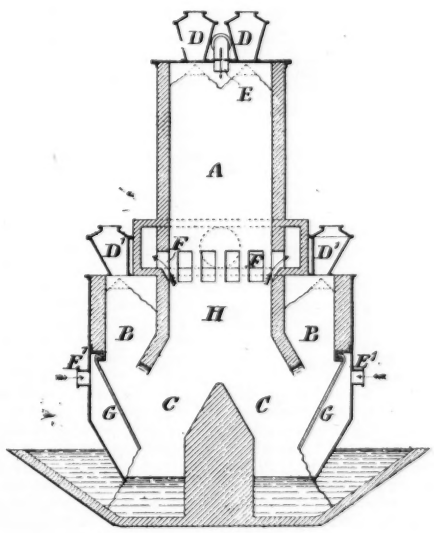
Manufacture of Producer Gas.—Schweich, E., of Hyde Park Square, W. No. 26,596; Dec. 4, 1903.

The object of this invention is to gasify fuels rich in volatile constituents "in such a way as to produce a gas free from tar, and at the same time to completely gasify the combustible matter contained in the fuel."

It is well known, says the patentee, that gas free from tar can be produced from bituminous coal (for instance) by working a producer by means of a down-draught, so that the zone of combustion is near the spot where the green fuel is introduced. By this method of working, there is the disadvantage that a quantity of coked fuel passes into the lower parts of the producer; and this cannot be gasified unless a supplementary blast is admitted at the bottom of the producer. A producer of this kind requires, however, very careful regulation, because the only combustible matter in the lower part of the producer, where a supplementary blast is admitted, consists of fuel which has escaped combustion in the upper part of the producer. If, therefore, owing to lack of regulation, an excess of air be admitted at the top, the quantity of fuel in the lower part of the producer will at times be insufficient to remove the oxygen from the air introduced at the bottom, and the gas produced will be of a poor quality, or partly burnt, or may even contain a large proportion of oxygen.

By this invention, a fresh supply of coke or bituminous fuel, together with a supplementary air or air and steam blast, is admitted into the lower zone of combustion of a producer working by means of a downward draught. Thus there is always present an ample quantity of fuel to combine with the oxygen of the air introduced into the lower zone, and the difficulties alluded to are overcome.

The vertical section of the producer shown is more particularly adapted to the case where bituminous fuel is introduced at the top. A large central chamber A is built between two smaller side chambers B, so as to extend considerably higher than the side chambers at its upper part; while at its lower part it merges into them so that there is a space C at this part common to the three chambers. The central chamber (in which downward gasification occurs) is provided with the usual feed hoppers D, one or more blast inlets E, and gas outlets F in



suitable positions. Each side chamber is provided with a blast inlet E^1 and the usual feeding hoppers D^1; the gas produced herein also leaving the producer by the outlets F, after having traversed an incandescent zone of coke or coke and ashes in the lower part H of the central chamber, whereby any tarry vapours contained in the gas produced from the supplementary supply of fuel are decomposed into permanent gases. The grates G are preferably below the lower end of the central chamber, and form two sides of the space C.

Double-Acting Gas-Engines.—Dudgeon, A. J.; a communication from the Société Anonyme John Cockerill, and Savage H., of Seraing, Belgium, No. 1892; Jan. 25, 1904.

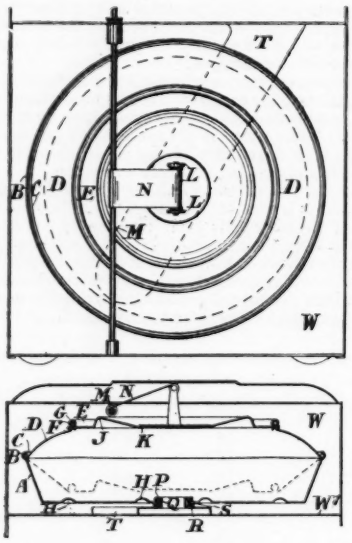
This invention, relating to double-acting gas-engines, has for its object to provide a simple construction of cylinder which will be symmetrical in form (and thus avoid the internal stresses set up by the unequal distribution of the cast metal) and which can also be readily dismounted.

The engine cylinder comprises: A lining, a casing, and a water-jacket between the lining and casing; a piston mounted on a piston rod, which extends through the cylinder covers in both directions,

disposed within the cylinder; covers having inner faces at or near the ends of the travel of the piston and outer faces carrying glands for the piston rod; ports symmetrically disposed about the axis of the cylinder in an extension of it passing through the water-jacket, openings in the covers leading to the ports in the jackets; tie rods passing along the whole length of the cylinder and through flanges in the outer faces of the covers, holding the covers together; a cradle in which the cylindrical jacket rests and in which it is free to expand; side frames bolted to the cradle, one end of the cylinder being attached to the side frames forming part of the main frame of the engine; and ignition devices and valves for starting the engine with compressed air disposed within the covers.

Gas-Meters.—Rombach, J. B., of Long Lane, and the Tourtel Manufacturing Company, Ltd., of Queen Victoria Street, E.C. No. 2058; Jan. 27, 1904.

This invention more particularly relates to the construction of detachable diaphragm chambers and diaphragms for dry gas-meters, as described in patent No. 10,770 of 1901, whereby the diaphragm chambers and diaphragm plates are rendered more rigid, their construction simplified, and the working rendered more accurate. For this purpose, a detachable diaphragm chamber (preferably in the form of a dish) is provided with strengthening ridges, preferably obtained by pressing out the metal of the dish. The diaphragm plates may be provided with suitable ridges, and a central ridge may be formed around the hole through which the diaphragm plates (when two are used) are riveted together, so that a cap may be soldered to cover the rivet, while the ridge to which the cap is soldered, being raised away from the leather diaphragm, prevents the leather from being damaged by the heat of the soldering iron.



A vertical section is given through a dry meter showing the diaphragm chamber in position; also a horizontal section through the meter and the centre of the diaphragm chamber, showing a diaphragm formed of a ring of leather, or its equivalent, and a single diaphragm plate; the extreme outward position of the diaphragm being shown in full, while its extreme inward position is shown in dotted lines.

W is the meter-case, and W^1 represents the middle partition, to which is secured the channel piece T, having a circular recess and hole at R to receive the male-threaded piece Q, which engages with the female piece P secured to the dish A (the joint being made by a leather or similar washer S). The bottom of the dish is provided with circular channels H to give it greater strength. The outer edge of the leather D is secured by a wire C over which the edge B of the dish is bent. The inner edge of the leather D is passed round a wire G, and over both the leather and the wire is bent the edge F of the diaphragm plate E, the extreme edge of which may be bent up to prevent the edge from cutting into the leather. The diaphragm plate E is pressed out at J and K, so as to give it greater strength. M is the ordinary flag-wire, N the flag, and L the brackets supporting the arbor to which the flag is attached.

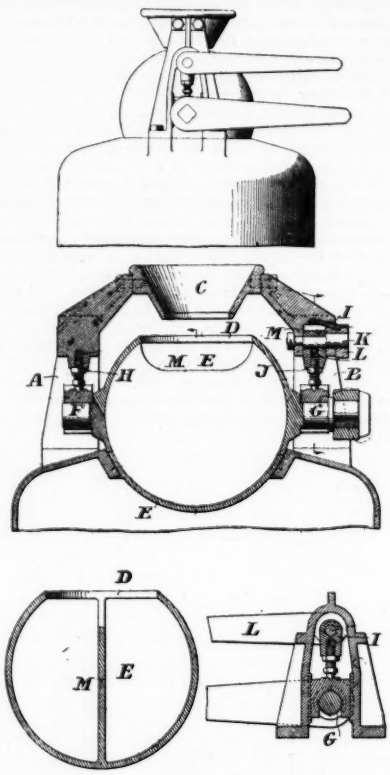
Gas-Retort Chargers.—Saltar, J., of Philadelphia, U.S.A. No. 2570; Feb. 2, 1904.

This invention relates to the feeding of fuel to gas-generators, comprising "a rotative or oscillative vessel having an opening in the top into which a charge of fuel is primarily received, and which is quickly semi-rotated with respect to the retort or producer casing in order to empty the fuel charge into the latter, after which the vessel is as quickly reversed, mouth upward, ready to receive another charge."

The illustration shows a side view of the upper portion of a gas-producer casing or vertical retort, a sectional view of the charging device, a transverse sectional view of the charging vessel shown in longitudinal section, and a sectional view of the clamping adjustable bearing for the charging vessel.

The mouth of the producer casing or retort is provided with the flange seat; the bearing-housings A B being mounted in alignment on opposite sides of the retort mouth, and serve to support the hopper C in registry with the fuel opening D in the charging vessel E. The trunnions F G of this vessel are mounted in slide bearing boxes, and the trunnion G is provided with a lever handle by which the vessel E may be rocked in the bearings to deliver the fuel charge through the retort mouth.

One bearing is maintained in definite but variable position with respect to the housing A, by means of an adjusting screw in threaded engagement with an aperture in the housing, and provided with a jam nut H. The other bearing is furnished with an adjusting screw, which is entered in threaded engagement with an opening in the strap I and provided with a jam nut J. The strap is mounted upon the eccentric



portion of the shaft K, whose opposite concentric ends are mounted in bearing lugs of the housing B. The shaft is provided with an operating lever L, by which it may be oscillated to raise or lower the strap so as to release the slide bearing, or press it, and the vessel E, downwardly to seal the mouth of the retort—it being understood that the vessel E is capable of gyrating slightly.

The interior of the charging vessel may be provided with a diaphragm or rib M to stiffen it between its supporting trunnions and thus prevent distortion of the walls and consequent leakage between the walls and the seat when the clamping pressure is applied to the trunnions. It also ensures that the fuel shall rotate with the vessel—thus "aiding in preventing its spilling, and also facilitates the discharge of the fuel when the vessel is in proper position."

The various forms of these fuel-charging vessels are similar in that their perimeters are symmetrical with respect to their axis of rotation, so as to present equal cross sectional areas within the retort mouths, in different rotary positions of the vessels, and the vessels are each arranged to hermetically seal a retort in both the position for receiving the fuel charge and in that for emptying it into the retort, so as to prevent the passage of air or gas through the retort mouth.

Lutes for the Covers of Gas-Purifiers.—Dempster, R., of Manchester. No. 2860; Feb. 5, 1904.

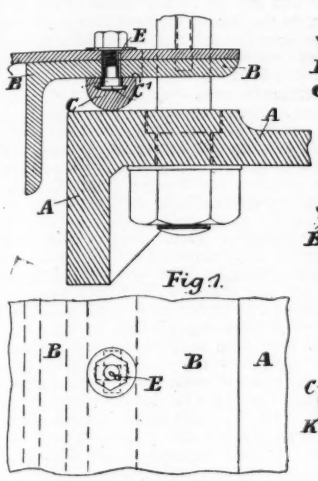
This invention relates more particularly to that class of lute wherein india-rubber, or similar elastic substances of solid formation, are employed between the underside of the lid or cover and the upper faces of the receptacle or tank, in order to form a gas or air tight joint when the requisite pressure is employed. The patentee proposes to form the rubber portion with a flat surface at the part in contact with the face to which it is to be attached and at suitable intervals along this flat surface, to cut or otherwise form grooves in such manner that the lower portions are undercut, or are of greater widths than the upper portions of the grooves. For the purpose of attaching the rubber, bolts or the like are provided, the head of each of which has an elongated axis in one direction relatively to the remainder of the head. The dimensions of the bolt are such that the narrow portion of the head is capable of passing through a hole or slot formed in the lid, and into the groove of the rubber lu ing; but on the partial rotation of the bolt, the projecting portions of its head enter the undercut part of the groove, when the tightening up of a nut on the external screw-threaded end of the bolt pulls the rubber into close contact with the lid or face to which it is to be attached.

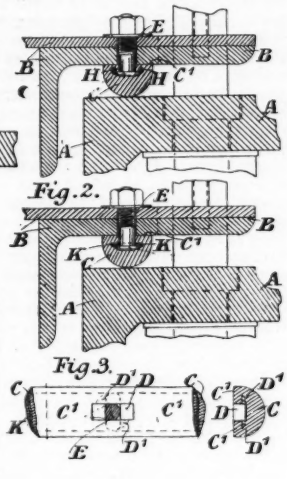
Fig. 1 (p. 983) is a sectional elevation and a plane view of a portion of a purifier and lid with the luting between arranged in accordance with one form of the invention.

Fig. 2 shows similar views but with the luting attachments arranged in a different way. Fig. 3 is a transverse section of a detail of the invention.

A is a portion of the tank side and top flange of a purifier, and B is

a portion of the lid. C is the india-rubber or elastic luting provided with a flat surface C^1. At suitable intervals along the surface are formed special grooves in the luting, such as D in fig. 3, in such a manner that the lower portions are undercut as at D^1, or are of greater widths than the upper portions of the grooves. E are the bolts pro-





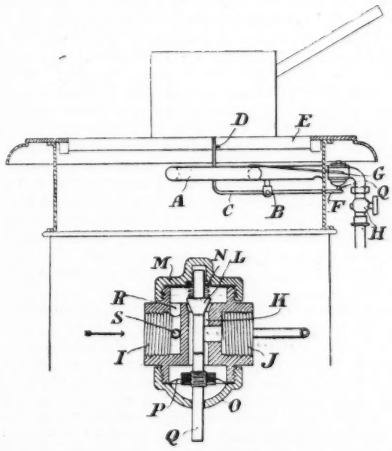
vided for attaching the luting to the lid of the purifier, each of which bolts is formed with a head having an elongated axis in one direction relatively to the remainder for the purpose already referred to.

In fig. 1 the bolt is provided with a shoulder for resisting the tightening-up action of the nut, and largely relieving the luting from strain from this cause. In fig. 2, wires H are embedded in the luting for the same purpose; or, as an alternative, the same object is attained by the use of a steel band K provided with holes or slots at the required positions in its length.

Gas Cooking Stoves and Burners.—Head, W. G., of the South Metropolitan Gas Company, Old Kent Road, S.E. No. 20,778; Sept. 27, 1904.

The object of this invention is to prevent waste of gas in gas cooking appliances when the cooking utensil is removed from the hot-plate of the cooker; the gas to the ring burner being cut off when the utensil is removed, and turned on again when it is replaced.

To the ring or other burner is secured a pendent boss or projection B, in which is pivoted a lever C. One end of the lever is turned upwards, as shown at D, and extends above the top of the hot plate E, so that a cooking utensil put on it will push down the lever. At the other end F, the lever bears against the spindle of a valve G situated in the gas-supply pipe between the ring and the gas-cock.

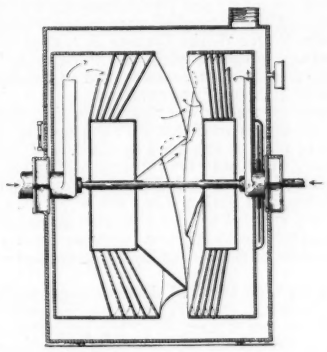


The valve G consists of a main body having a gas-inlet at I and an outlet at J. Central of the body is a vertical passage K in connection with the outlet J. At the top of the passage is a seating for a cone valve L, which is provided with a stem both above and below. The upper stem extends into a recess formed in a cap M, which is screwed on to the top of the body; and between the cap and the valve is placed a spring N, the tendency of which is to force the valve L down upon its seat. At the bottom is another cap O in which is placed a diaphragm P, the edges of which are gripped between the body and the cap when the latter is screwed on. The diaphragm carries a spindle Q, which projects at one end through the cap, and the other end extends upwards to meet the lower stem of the valve L.

The lever C bears against the end of the stem Q; and when the utensil is placed upon the hot-plate and depresses the lever C, the stem Q will be forced upwards and raise the valve L off its seat, leaving a passage for the gas to the outlet J. The gas entering by I will pass through the opening R into the valve-chamber, and thence, by the passage K, to the outlet J, which is connected with the burner. S is a bye-pass by which the gas passes to a pilot light—suitably arranged in relation to the burner. When the cooking utensil is removed, the spring N comes into operation and pushes the valve L down on to its seat; thus cutting off the supply of gas to the burner—the pilot light alone remaining alight.

Gas and Air Mixing Apparatus.—Dodge, C. C., of New York. No. 21,776; Oct. 10, 1904.

This invention relates to apparatus of the kind in which a gas-meter drum and an air-meter drum are mounted on the same shaft in a casing, and in which the pressure of the gas is utilized directly for revolving the gas-drum, and thereby revolving the air-drum, for mixing gas and air, or gaseous fluids of different gravities, in the desired proportions "to obtain a perfectly-homogeneous mixture of gas and air for heating and illuminating purposes." The object is to hold the gas in full abeyance in the gas-chamber of the gas-drum, at all times and under any pressure, so that the measuring compartments can pass gas only when the mixture is being used at the burners.



By completely controlling the gas-pressure by the apparatus shown, the patentee is enabled to increase the pressure of the gas and air mixture and hold it under pressure at all times—substantially the same as the illuminating gas—producing a gas and air mixture that will "at all times be operative and fully automatic." In order to accomplish this, two or more liquid seals are arranged as shown at the central opening in the head of the gas-drum to fully obstruct any desired gas pressure without friction in the revolution of the gas and air mixing drums. Provision is also made for giving to the gas and air drums the required buoyancy to float them, so that a low pressure of gas will readily revolve either small or large mixing-drums.

APPLICATIONS FOR LETTERS PATENT.

27,020.—M'Intosh, J. C., "Incandescent burners." Dec. 12.
27,027.—Cawthorn, G. H., "Automatic lamplighting." Dec. 12.
27,036.—M'Gonigal, D., Payne, R. F., and Crawford, R., "Suspending mantles." Dec. 12.
27,057.—Wood, E., "Incandescent burners." Dec. 12.
27,066.—Oppenheimer, J., "Two-stroke internal combustion engines." A communication from A. G. R. Carlsund. Dec. 12.
27,158.—Smith-Rewse, H. S., "Washer-scrubbers." Dec. 13.
27,194.—Mardon, F., "Luteless purifiers." Dec. 13.
27,237.—Berry, J., "Gas-generator." Dec. 14.
27,249.—Todd, H. L., "Automatic extinguishing devices or lamps." Dec. 14.
27,262.—Verwey, A., "Gas-stove." Dec. 14.
27,297.—Giorgi, G., "Lighting and extinguishing gas-lamps by electricity." Dec. 14.
27,308-9.—Ward, J., "Tar paving." Dec. 15.
27,342.—Akester, W. H., "Mantles." Dec. 15.
27,349.—Arzt, A. H., and Baron, S., "Gas-burners." Dec. 15.
27,359.—Akester, W. H., "Mantles." Dec. 15.
27,365.—Talbot, B., "Purifying producer gases." Dec. 15.
27,423.—Marland, A., and Warburton, H., "Incandescent lighting." Dec. 16.
27,431.—Dewey, H., "Supporting mantles." Dec. 16.
27,491.—Stidder, J. G., and Cooper, J. E., "Gas-fires." Dec. 16.
27,519.—Viarmé, G., "Producer gas." Dec. 16
27,571.—Hall-Brown, E., "Gas-producers." Dec. 17.
27,576.—Rosie, J., "Automatically lighting and extinguishing gas-lights by momentary increase of pressure." Dec. 17.
27,607.—Haight, T. S., "Outdoor gas-lamps." Dec. 17.
27,614.—Haenke, M. W., "Lighting and extinguishing gas-lights by the gas pressure." Dec. 17.

Estimated Cost of Water Gas at Rochdale.—Figures which have been supplied to the members of the Rochdale Gas Committee show that the installation of water-gas plant, though it will cost £15,000, is expected to effect a saving of over £700 a year. About 10,000 tons of coal are dealt with every year at the old retort-house, which it is proposed to pull down and reconstruct for the production of water gas. As compared with the newer side of the works, the extra cost of labour at this old retort-house is 1s. 1¾d. per ton; and fuel and maintenance also entail a heavier cost; the total being 2s. 1¾d. per ton more than in the newer portion. This, on 10,000 tons, represents an annual loss of £1072. It is estimated that the money necessary to rebuild the house, and to put in the carburetted water-gas plant (two sets) would, at 3½ per cent., involve an annual outlay of £542, or £530 less than the present expenditure. In six years, the extra expense of working at the old retort-house would total over £6137, and in wear and tear an additional £1214; making a total of £7651. Interest on the amount necessary for new works would in this period reach £3200 odd, or £4450 less than the amount estimated as the cost of working the old retort-house. This equals £741 per year.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, Dec. 20.

(*Before the* MASTER OF THE ROLLS *and Lords Justices* STIRLING *and* MATHEW.)

Bilston Urban District Council v. Earl of Dudley.

This was an appeal by the defendant from a decision of Mr. Justice Channell, on a special case; and it raised the question whether the Earl of Dudley was entitled to have a supply of water to a house in the parish of Himley, without paying 10 per cent. per annum on the expense of laying the mains and pipes necessary for taking such supply beyond the limits of the prescribed area to the house, as provided by section 35 of the Water-Works Clauses Act, 1847. The proceedings in the Court below were reported in the "JOURNAL" for the 17th of May last (p. 453); and the case was argued at considerable length on the 1st inst., when judgment was reserved.

The appellant's contention was that the section of the Water-Works Clauses Act cited was inconsistent with the Special Act of the Bilston Commissioners of 1893, as amended by the Act of 1896; and that the parish of Himley, which was first brought within the limits of supply by the Act of 1896, being excluded from a proviso referring to certain adjoining parishes, and giving them the right to a water supply on special terms, was entitled to it on the same terms as to water-rates as if it were within the prescribed area, without having to pay anything additional in respect of the cost of laying the mains and pipes beyond that area.

Mr. DANCKWERTS and Mr. R. J. PARKER appeared for the appellant; Mr. MACMORRAN, K.C., and Mr. LEESE represented the respondents.

The MASTER OF THE ROLLS, in giving judgment, said that though the provisions of the Special Acts imposed an obligation on the plaintiffs to lay pipes and mains to the houses within certain districts, no such obligation was imposed upon them in regard to the parish of Himley. There was an obligation to supply water to that parish; but the express provision which would have given the appellant the right he was contending for, of having the water brought to his door, was absent. This being so, the Water-Works Clauses Act was let in, and section 35 of the Act exactly met and provided for such a case as this. The judgment of Mr. Justice Channell was therefore perfectly right, and must be affirmed.

Lords Justices STIRLING and MATHEW concurred.

The appeal was accordingly dismissed, with costs.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Dec. 19.

(*Before Mr. Justice* PHILLIMORE.)

Devonport Water Company and Devonport Corporation.

This was an award stated in the form of a special case by Mr. A. J. Ram, K.C., the Umpire appointed by the Arbitrators who sat to determine the amount to be paid by the Corporation of Devonport for the undertaking of the Water Company (*ante*, p. 419). The question for the Court was whether, having regard to the construction of the statute of 33 Geo. III., cap 85, the Admiralty were restricted, in the user of the water supplied to them under the provisions of section 20, to the precincts of His Majesty's Dockyard in the town of Plymouth Dock as it existed at the date of the passing of the Act. If the Court was of opinion that the Admiralty was so restricted, the Umpire awarded the sum of £268,123 as due and payable to the Company from the Corporation; but if, on the other hand, it was not so restricted, the sum was fixed at £209,920. In 1902 the Corporation obtained an Act of Parliament which gave them power for the compulsory purchase of the water undertaking; one clause providing that, in the event of difference, the amount to be paid should be settled by arbitration. Mr. George H. Hill and Mr. Charles Hawksley were appointed Arbitrators, and they appointed Sir Frederick Bramwell as Umpire. Before making his award, Sir Frederick Bramwell died; and, by consent, Mr. Ram, K.C., was appointed in his place. He, after reading the shorthand notes, made the award in dispute. Section 17 of the Water Company's Act of 1793 provided that the Company should supply the several departments of the Office of Ordnance at Plymouth Dock with water as follows: The Governor's house and offices within the lines were to be supplied with water from the reservoir by a pipe of 2-inch bore; the troops quartered in each square of the barracks standing within such lines by a pipe of 1-inch bore to each square of such barracks; the Gun Wharf by a pipe of 3-inch bore, to be brought to such part of the wharf as the Master-General or principal officers of the Ordnance for the time being should direct or appoint; and the new powder magazine at Keyham Point was to be supplied by a pipe of 1-inch bore. In consideration of these several supplies, the yearly sum of £200 was to be paid. Section 18 provided that the water supplied for the Ordnance was not to be appropriated to any other use. By section 20 it was provided that, in case the Commissioners of the Navy thought fit, the Dockyard was to be supplied with water in consideration of an annual payment of £500; the words being: "If the principal officers and Commissioners of of H.M. Navy for the time being shall at any time hereafter deem it expedient that H.M. Dockyard at the town of Plymouth Dock, the Royal Hospital and Marine Barracks at Stonehouse, and the ships and vessels belonging to His Majesty, should be supplied with water." Section 19 of an Act passed in 1871 defined the boundaries of the town of Plymouth Dock; and the Umpire found there was no evidence to show whether the different departments of the Admiralty, Navy, and Victualling at the Dockyard at the town of Plymouth Dock in the 33rd year of George III. were wholly within the Dockyard as it then existed, or partly within and partly beyond it. By an Order in Council dated Dec. 24, 1823, it was directed that the town of Plymouth Dock should be called and known by the name of Devonport. Establishments belonging to the Lords Commissioners of the Admiralty had from time to time been formed, and these were within the Company's area of supply, and were regarded by the Admiralty, and were by them described, as being departments of Devonport Dockyard; they being under the superintendence of the Admiral and other officers appointed by the Dockyard. From the date of the opening of the works, a supply of water, as provided by section 20, had been furnished by the Company to the Admiralty, and in respect thereof the annual sum of £500 was paid until 1898. In that year a portion of the Company's area in which were situated the Marine Barracks was, under and by virtue of the Devonport Water-Works Act, 1898, sold by them to the Stonehouse Local Board; and since that date the sum of only £425 had been paid by the Admiralty. Contracts had from time to time been entered into between the Company and the Admiralty for a supply of water to certain establishments. The quantity of water hitherto taken by the Admiralty per day through the 6-inch pipe, by which was conveyed the water supplied under section 20, was considerably less than that which such pipe was capable of carrying. The Admiralty now claimed that they were entitled to use the supply of water given through the 6-inch pipe for the whole of their establishments at Devonport Dockyard, whether within or beyond the precincts of the Dockyard of the town of Plymouth Dock as it existed at the time the Act of 1793 was passed. The first intimation of such claim by the Admiralty against the Company was made in the course of the arbitration, when it was contended for the Corporation, and denied by the Water Company, that the Admiralty were so entitled.

Mr. DUKE, K.C., Mr. DANCKWERTS, K.C., and Mr. CLAVELL SALTER, K.C., represented the Company; the Hon. J. D. FITZGERALD, K.C., and Mr. HONORATUS LLOYD, K.C., appeared for the Corporation.

Tuesday, Dec. 20.

Justice PHILLIMORE, in giving judgment, said a large part of the argument had been devoted to the question of whether or not the case was sufficiently stated; and, in the next place, to whether or not it should be remitted back to the Umpire. It might be that the decision he was about to pronounce upon the case as it stood would render it unnecessary that this should be done; but he thought it more than probable that one of the parties would desire to have it remitted. Under the Act of 33 Geo. III., the Navy Board had a right to require a supply of water through a 6-inch pipe to a reservoir which they were to build on some place outside the Dockyard; and, secondly, they might require a direct supply to the Naval Hospital, and a third supply to the Naval Barracks and for watering ships. At some time or other, under that provision the Navy Board did require the Company to supply water, and they constructed near the Dockyard a reservoir from which they distributed the water through certain pipes, as they were entitled to do by the Act. Now that the Corporation had been empowered by statute to take over the privileges and duties of the Company, the Umpire had been asked to say what sum of money should be paid by the Corporation to the Company as the purchase price of their undertaking. The Umpire had found that it would be either £268,123 or £209,920, according to the way in which the question was answered by the Court. He was of opinion that the Admiralty were not so restricted. Section 20 empowered the Navy Board to build a reservoir outside the dockyard, and to receive a supply of water for the offices of the three departments—the Admiralty, the Navy, and the Victualling Department; the officers of these departments being at liberty to apportion the water among the different establishments in such manner as they thought fit. The water to be supplied, according to section 20, was not limited to dockyard purposes proper or to buildings within its precincts as it then existed; but there appeared to be a restriction to offices which were at or near or in some way connected with the locality, either by continguity or by administrative connection with the occupier. The section did not enable the various Commissioners who executed the functions of government with regard to the Navy to require a supply of water at a different dockyard from the one in the town of Plymouth Dock. This being so, he must answer the question in a sense favourable to the Corporation; but he was unable to compel the Company to rest on the case as it stood. The Umpire had apparently taken 29 years' purchase of the annual sum of £2007, which was the total of the ten items of rent paid under the contract by the Admiralty for the supply which had hitherto been deemed not to be within section 20; but he had not taken notice of the intermediate position. As the Admiralty were not restricted to the precincts of the old yard, any ordinary extension of it would be entitled to be supplied from the Navy Board's reservoir without further payment; but section 20 did not apply to separate docks or establishments. It would have been better had the Umpire asked the intermediate question, whether the Commissioners were entitled to use the supply of water for any, and which, of the establishments. It seemed to him that the Umpire had simply capitalized the sum at 29 years' purchase; and if any one of the ten items was ruled out, then 29 times that value ought also to be ruled out. However, he did not decide this point, because he was not certain that this was the principle on which the Umpire had gone. All he decided was that the larger claim put forward by the Water Company failed; but if within fourteen days they gave notice of their desire to have the case referred back to the Umpire for further facts to be stated, this would be done. If they did not so desire, then the question would be answered in the way contended for by the Corporation, and the Company would have to pay the costs; but if the case were referred back, the costs would be reserved for further consideration. If the Umpire had not the necessary evidence to enable him to state the further facts, the parties were to be at liberty to tender it.

MISCELLANEOUS NEWS.

PROJECTED GAS LEGISLATION FOR THE METROPOLIS.

The deposit, in the Private Bill Offices of both Houses of Parliament, on the 17th inst., of prints of the Bills which it is proposed to introduce next session, enables us to give fuller details of those affecting the Metropolis than we were in a positton to furnish on the publication of the notices.

Gaslight and Coke, South Metropolitan, and Commercial Gas Bill.

The object of this Bill, as our readers are aware, is to amend the Acts relating to the above-named Companies "with regard to the testing of gas, procedure for forfeitures, and otherwise." The preamble recites the various Acts in question, and then points out that by the one passed in 1880 (the Gaslight and Coke and other Gas Companies' Acts Amendment Act) the Companies were made liable to certain forfeitures in case of default in respect of the illuminating power, purity, and pressure of their gas. It is then stated to be expedient to make further provisions with respect to testing, the determination and recovery of the forfeitures, and the procedure to be adopted in connection therewith; to amend the various Acts; and to make further provisions in regard to the functions of the Chief Gas Examiner. This completes the preamble.

The first three clauses of the Bill set forth that the Act may be cited as "The Metropolis Gas (Testing of Gas) Act, 1905;" that it is not to extend or apply outside the limits of the Administrative County of London, but that it is to apply to the three Companies named and the districts within the Administrative County supplied by them. The next clause defines the expression "controlling authority" as meaning, as regards the City of London, the Mayor and commonalty and citizens, and as regards the County of London, the London County Council. The succeeding clause sets forth that the term "day," when used in any enactment relative to testing a company's gas, means "twenty-four hours, reckoned from midnight to midnight." Clauses 6 to 8 deal with the testing of gas for illuminating power. The burner is to be Sugg's No. 1 "London" argand, with a 6-inch by 1⅞-inch chimney. The standard of comparison is to be Harcourt's 10-candle pentane lamp; and the photometer, the table photometer in use at the passing of the Act, but "modified by having the prescribed burner carried on a traversing slide." Each testing is to be made with the gas-flame of such length that the irregularities of its upper edge appear to be equally divided by an imaginary horizontal plane 3½ inches above the upper surface of the steatite ring of the prescribed burner. Other directions are given in regard to the method of testing. The illuminating power of the Gaslight and Coke Company's gas is to be deemed to be 16 candles if, when tested in the manner prescribed, it is equal to 1·6 times that shown by the standard lamp when the actual consumption of gas by the prescribed burner shall have been calculated back to the rate of 5 cubic feet per hour; that of the South Metropolitan and Commercial Companies' gas to be deemed to be 14 candles, when it is equal to 1·4 times that shown by the standard lamp, when the gas consumption has been calculated back.

We now come to the part of the Bill dealing with the question of purity. By clause 9, the gas supplied is to be as far as practicable free from sulphuretted hydrogen; but no penalty is to be incurred in consequence of the presence of this impurity in the gas, unless the quantity exceeds 1 grain per 100 cubic feet. Not more than 4 grains of ammonia are to be present in this quantity of gas. The testing for sulphuretted hydrogen is to be made according to the method prescribed in a schedule to this Bill. A Gas Examiner is to make tests at any testing-place on such days (exclusive of Sunday) as the controlling authority shall direct, for ascertaining whether, during the whole of such day, the illuminating power and purity of the gas are such as are respectively prescribed. The tests for illuminating power are to be taken at intervals of not less than one hour. In the event of the gas being found to be defective in any particular, the Examiner is to immediately give notice in writing to the company concerned of the result of the tests. The testings for illuminating power are to be three daily; but if the average of the three falls below the prescribed illuminating power, a fourth is to be made. The gas under examination is to be kept burning so that the flame is about the height of 3½ inches for at least 30 minutes before any testing is made. Clause 12 specifies that, notwithstanding anything in this or any other Act contained, no testing of the gas is to be made between the hour of midnight on Saturday and the hour of midnight on Sunday; and no company is to be required to give to any Gas Examiner access between those hours to any testing-place. The next clauses set forth that the average of all the testings of the illuminating power and purity of the gas supplied at a testing-place on any day on which the tests shall be made is to be deemed to represent the illuminating power and purity of such gas on that day. The company concerned may be represented at the testings.

The next clauses relate to the duties of the Gas Examiners. Each Examiner, on the day on which testings have been conducted by him, is to make and serve upon the company a report of the result of such testings on that day, to the controlling authority, the Gas Referees, the Chief Gas Examiner, and the company, and the books kept by an Examiner for recording the results of his testings are to be open at all reasonable times to the inspection of the company, without payment. If any company think themselves aggrieved by any report, they may, within seven days after the day on which it is delivered to the company, appeal to the Chief Gas Examiner, whose decision, after hearing the parties, is to be final and conclusive; and he is forthwith to report every such decision to the controlling authority and the company. If in any case the latter do not appeal, the report of the Gas Examiner is to be final and conclusive. The report of the Chief Gas Examiner on appeal, or that of a Gas Examiner after the time for appeal has elapsed and none has been brought, showing a case of defective illuminating power, excessive impurity in, or insufficient pressure of, the gas supplied, is to be conclusive evidence of the liability of the company concerned to a forfeiture in respect thereof. Within one week after the end of each quarter, the Chief Gas Examiner is to make a report to the controlling authority and to the company, setting out the results of each testing made in that quarter of the gas supplied by them.

We now reach the penalizing clauses of the Bill, which are as follows:—

20.—Subject as hereinafter provided, if on any day the gas supplied by the company at any testing-place is of less purity in respect of sulphuretted hydrogen or ammonia than it ought to be under the provisions of this Act, the company shall forfeit a sum not exceeding £50 for each occasion on which they are so in default: Provided always that the controlling authority of any testing-place, having recovered one forfeiture in respect of excess of impurity in the gas supplied by the company at one testing-place on any day, shall not be entitled to any further forfeiture in respect of excess of impurity in the gas supplied by the company at any other testing-place of such controlling authority on the same day.

21.—(1) Whenever the company shall have incurred a forfeiture in respect of illuminating power, purity, or pressure of gas, the controlling authority may apply to the Chief Gas Examiner for a certificate that the company have incurred such forfeiture; and the Chief Gas Examiner shall issue a certificate accordingly, stating the amount of such forfeiture.

(2) The Chief Gas Examiner shall decide whether or not the default imputed to the company was substantial, and due to careless conduct of their works by the company.

(3) Where the Chief Gas Examiner is of opinion that the default is of a substantial character, and due to the careless conduct of their works by the company, he shall certify that the company have incurred the maximum penalty applicable to the offence; and where he is of opinion that the default imputed to the company is not substantial, or is not due to the careless conduct of their works, he shall assess the forfeiture at such amount as he shall think reasonable in the circumstances of the case.

(4) The Chief Gas Examiner shall issue his certificate to the company concerned and to the controlling authority, and the amount of such forfeiture so assessed by him shall be deemed to be the amount of the penalty in respect of the offence, and such amount shall be applied and appropriated in the same manner as provided for by sections 46 and 53 of the Metropolis Gas Act, 1860; and subject as hereinafter provided, no proceedings shall be taken against the company for the recovery of a penalty in respect of such offence.

(5) Provided that if the company do not pay the amount of such forfeiture within fourteen days from the date of the certificate, the controlling authority may proceed to recover the same in the same manner as a penalty is recoverable in a Court of Summary Jurisdiction.

(6) No forfeiture shall be incurred in any case with respect to which it is certified by the Chief Gas Examiner that the defect of illuminating power, excess of impurity, or insufficiency of pressure was occasioned by an unavoidable cause or accident.

By the next clause, if a company consider that any requirement made by the Gas Referees is unreasonable, they may, within fourteen days after the publication or notification of such requirement, appeal to the Chief Gas Examiner; and after hearing the company and the Gas Referees (if the latter think fit to be represented at the hearing) he is to decide whether such requirement is reasonable, and rescind, confirm, or modify it accordingly. His decision is to be final and conclusive. If in any case the company do not appeal, a requirement of the Gas Referees is to be binding on them.

From and after the passing of the Bill, certain sections of the various Acts concerned (specified in a schedule), as well as any other provisions which may be inconsistent with, or repugnant to, the provisions of the Act applied for, are to be repealed. This repeal, however, is not to affect the past operation of any enactment repealed, nor anything done or suffered thereunder; any right, privilege, obligation, or liability acquired, accrued, or incurred under any such enactment; any penalty, forfeiture, or punishment incurred in respect of any offence or default committed against any repealed enactment; nor any investigation, legal proceeding, or remedy in respect of any such right, privilege, obligation, liability, penalty, forfeiture, or punishment; and any such investigation, legal proceeding, and remedy may be carried on as if the Bill had not been passed.

The final clause provides that all costs, charges, and expenses incidental to the preparing, obtaining, and passing of the Bill are to be paid by the three Companies in such proportions as they may agree.

London Gas Bill.

This Bill is promoted by the London County Council to "amend the Acts relating to the supply of gas in London, and to make further provisions with reference thereto." The preamble opens with the statement that the three Companies referred to in the preceding Bill have been authorized to supply gas in several districts within the Administrative County of London, and that various Acts have been passed from time to time containing provisions with respect to such supply. It is then stated to be expedient that certain provisions of the Act of 1880, and of other Acts relating to the Companies, with respect to the testing of gas for impurity, should be relaxed, that the standard price of gas should be reduced, and that some sections of the Metropolis Gas Act, 1860, which have ceased to apply to any existing gas company should be repealed.

The Act is to be cited as "The London Gas Act, 1905," and is to come into operation on Jan. 1, 1906. The Act of 1880, as amended, and the proposed Act are to be construed together and read as one. The burner to be used for testing the gas supplied by the companies is to be Sugg's "London" argand, with a 6-inch by 1⅝-inch chimney. Clause 4 deals with illuminating power. It specifies that the gas supplied by the South Metropolitan and Commercial Companies is to be of 13-candle power; and the Acts of 1900 and 1902 relating to these Companies are to be amended in respect of the provisions for 14 candles therein contained. Clause 5 enacts that the Gas Examiner is to test the gas for "calorific power, purity as regards sulphur other than sulphuretted hydrogen, and illuminating power as ascertained by means of a flat-flame burner to be prescribed by the Gas Referees." Each

Examiner is to report to the Gas Referees, the Chief Gas Examiner, and the company concerned the result of each test; and the company are not to be liable to forfeitures in respect of any testings made under these provisions. Clause 7, which suspends liability to forfeiture for sulphur impurities other than sulphuretted hydrogen, is as follows:—

The Gas Referees shall from time to time report to the Board of Trade whether any, and if so what, method which will not cause a nuisance in the neighbourhood of the company's works can be adopted for the removal from gas supplied by the company of sulphur impurities other than sulphuretted hydrogen; and upon any such report, the Board of Trade may, if they think fit, and they are hereby authorized to make, an order applying to the company the provisions of any Act relating to the company with reference to sulphur impurities other than sulphuretted hydrogen and forfeitures in respect thereof. The liability of the company to any forfeiture by reason of the presence in the gas supplied by the company of sulphur impurities other than sulphuretted hydrogen shall be suspended until any such order as aforesaid shall have been made by the Board of Trade.

The Council proposed to alter the standard prices of the three Companies as follows: Gaslight and Coke, 3s. 3d.; Commercial, 3s. 2d.; South Metropolitan, 3s. The Companies are to connect their testing-places with such main or mains as may be prescribed by the Gas Referees, by means of one service-pipe only, which is to proceed direct from the main into the testing-place; and there is to be "no pipe, tap, or branch connected in any way with such service-pipe outside the testing-place." The Companies are to be allowed to appeal to the Chief Gas Examiner against any prescription or certification of the Gas Referees. Clause 11 relates to Sunday testing. It sets forth that, notwithstanding anything contained in the Act of 1880 or any other, it was not to be obligatory on the controlling authority "to make on Sunday any testings of gas;" and in any case in which the authority do not make tests on Sunday, any provisions relating to testing are to be read and construed "as if Saturday were, as the case may be, the day preceding or immediately preceding, or the previous day to, Monday, and Monday were the day following Saturday."

It is proposed to repeal section 12 of the Act of 1880, allowing appeal to the Chief Gas Examiner, and to substitute the following provisions:

If the company think themselves aggrieved by any report of a Gas Examiner, they may, within seven days after the day on which that report is delivered to the company, appeal to the Chief Gas Examiner, who may confirm, amend, vary, or annul such report, and whose decision, after hearing the parties, shall be final and conclusive; and the Chief Gas Examiner shall forthwith report every such decision to the controlling authority and to the company. If in any case the company do not appeal as aforesaid, or if, having appealed, they withdraw the appeal, the report of the Gas Examiner shall be final and conclusive. In the event of the company appealing to the Chief Gas Examiner and withdrawing the appeal, the company shall forthwith give notice of such withdrawal to the controlling authority.

The Chief Gas Examiner is to have power to give his decision on any matter referred to him without hearing any party who shall fail or neglect to attend before him after receiving not less than seven days' notice of the time and place fixed for hearing the matter. It is proposed to give the Chief Gas Examiner further powers in regard to forfeitures. Their nature will be seen from the following clause:—

If the Chief Gas Examiner, in giving his decision upon any appeal made to him by a company against the report of a Gas Examiner, shall certify that the default of the company is not substantial, or not due to the careless conduct of the company or their servants, proceedings shall not be taken before a Petty Sessional Court for the determination of the amount of the forfeiture to be paid by the company in respect of such default; but the Chief Gas Examiner, if requested so to do by the controlling authority at the time of hearing such appeal or giving his decision thereon, or at any time within six months after the date of his decision, may, after hearing the Council and the company, determine, subject to the provisions of section 14 of the Act of 1880, the amount of forfeiture to be paid by the company in respect of such default. The amount of any forfeiture fixed by the Chief Gas Examiner under this section shall be recoverable summarily as a civil debt from the company, and appropriated in the same manner as if the amount of such forfeiture had been fixed by a Petty Sessional Court.

Section 18 of the Act of 1880 is to be repealed, and in lieu thereof it is proposed to enact that the report of the Chief Gas Examiner, or, in the event of there being none by him, of the Gas Examiner, is to be conclusive evidence of liability to forfeiture for deficient illuminating power, excessive impurity, or insufficient pressure. If the prescriptions of the Gas Referees are not complied with, the defaulters are to be liable to a penalty not exceeding £50 per day during the continuance of the refusal or neglect. The remedy provided by this clause of the Bill is to be in addition to, and not in derogation of, any existing remedy. Proceedings in case of forfeiture are to be taken within six months after the date of the report; and any report or certificate of the Chief Gas Examiner purporting to have been signed by him is to be *primâ facie* evidence of the making and signing thereof, without proof of the signature. The portions of the Acts to be repealed are specified in clause 21 of the Bill and in a schedule. Provision is made for defraying, out of the Council's funds available for general county purposes, the expenses incidental to obtaining the proposed Act.

South Metropolitan Gas Bill.

The object of this Bill is to provide for the retirement of the Gas Referees, to empower the South Metropolitan Gas Company to purchase lands, and for other purposes. The long preamble is practically an epitome of the gas legislation of the past 35 years, especially in connection with the testing of gas and the duties of the Referees; and the views of the promoters in regard thereto are expressed as follows:—

The remuneration of the Gas Referees and the fulfilment of their requirements in relation to testing and otherwise have involved the three Companies [Gaslight and Coke, South Metropolitan, and Commercial] in the expenditure of large sums of money which would otherwise have been available for reduction of the price of gas supplied by the three Companies respectively in accordance with the sliding-scale provisions applicable to them without the quality and illuminating power of such gas being impaired. The continuance in office of the said Gas Referees is unnecessary; and it is expedient, in the interests of consumers of gas as well as of the three Companies, that such Referees should cease to exercise their functions, and should retire from office, that such provisions as are contained in this Act should be made with respect to the powers of the Chief Gas Examiner, and that the provisions contained in this Act with respect to the testing of gas should be made.

The preamble goes on to state that the Company have acquired an interest in certain lands and premises in Camberwell, but that other interests therein are outstanding; and therefore it is expedient that the Company should be authorized to acquire them, in order that the property may be utilized for the purposes of their undertaking. The Bill is divided into four parts: (1) Preliminary; (2) Retirement of Gas Referees and Provisions as to Testing; (3) Acquisition of Lands; (4) Miscellaneous. It is with the second part that we are chiefly concerned.

The first clause in the portion of the Bill just referred to sets forth that from and after the passing of the Act the Referees shall cease to hold office and receive remuneration, and the Board of Trade are not to appoint any successors to the office. The South Metropolitan Company will pay them as compensation a sum equivalent to seven years' purchase of their annual fees; and the Gaslight and Coke and Commercial Companies are to be allowed to contribute to the compensation. Such of the provisions of the Gas-Works Clauses Act, 1871, as relate to the testing of gas are to be modified by the Act, and extended to the three Companies; and for the purpose of the application of the provisions so modified to their undertakings the Act is to be deemed the Special Act. Full directions are given in regard to the method of testing. The gas of the South Metropolitan and Commercial Companies is to be deemed to be of the illuminating power of 14 candles, and that of the Gaslight and Coke Company 16 candles, when tested in the manner prescribed, which is similar to that contained in the Act applying to the three Companies already noticed. There are to be three testings daily; and if the average falls below the power prescribed, a fourth is to be made. It is proposed to repeal certain sections of the Acts of the Company passed in 1869, 1876, and 1900, of the 1875 Act of the Commercial Company, of the 1868 Act of the City of London Company, and of the Acts of the Gaslight and Coke Company passed in 1868, 1876, and 1880. All the provisions of these Acts which are not expressly repealed are to continue in force except that they are to be read and have effect as though all allusions to the Referees were omitted therefrom. All the provisions of the Acts relating to the Chief Gas Examiner are to continue in force, and his powers may at any time be extended by an Order made by the Board of Trade, so as to enable him to undertake such of the duties previously performed by the Referees as may be necessary, with such increase of emolument as the Board may determine.

In the "Miscellaneous" part of the Bill, the Company seek to have the exemption from liability to distress for rent conferred by section 159 of the Act of 1842 extended to all gas-engines, apparatus, fittings, and appliances let on hire by them. In the event of any meter being found to register erroneously, such erroneous registration is to be deemed to have first arisen during the last preceding quarter of the year, unless it can be proved to have first arisen during the then current quarter. All gas-engines, apparatus, fittings, and appliances let by the Company on hire are, notwithstanding that they may be fixed or fastened to any part of the premises in which they may be situate, or to the soil under such premises, at all times to continue the property of, and be removable by, the Company; but they are to bear a distinguishing metal plate, brand, or other mark, sufficiently indicating the Company as the actual owners. The Company seek power to sell or lease lands.

There are two schedules to the Bill. The first contains detailed regulations in regard to the use of the standard lamp and the pentane employed therewith, tables for correcting variations of temperature and pressure, the mode of testing the purity of the gas, and regulations as to the use of the photometer, &c. The second schedule specifies the Acts proposed to be repealed, and the extent of the repeal.

South Suburban Gas Bill.

This Bill has been promoted to alter the provisions of the Acts relating to the South Suburban Gas Company with respect to the illuminating power and the testing of their gas. The preamble recites that by their Act of 1873 the illuminating power of the gas was fixed at 14 candles, as tested by Sugg's "London" argand burner No. 1, consuming 5 cubic feet per hour, with a 6-inch by $1\frac{3}{4}$-inch chimney. By their Act of 1893, the illuminating power was raised to 15 candles, and the prescribed burner was to be Sugg's 16-candle "London" argand No. 1. Reference is then made to the adoption by the Board of Trade, since the Act of 1893, of the Harcourt 10-candle pentane lamp and the table photometer as the standard and apparatus to be used for measuring the illuminating power of gas supplied in the Metropolis; and it is stated to be expedient that the provisions in the Bill with reference to the illuminating power and the testing of gas should be made in lieu of those contained in the Acts of 1873 and 1893 respectively. As to purity, by the Act of the first-named year, the Company's gas was not to contain more than 20 grains of sulphur per 100 cubic feet. But by section 28 of the Act of 1893 it was provided that no forfeiture should be incurred in respect of any defect of illuminating power or excess of impurity occasioned by unavoidable cause or accident; and in the case of an excess of sulphur, unless such excess should amount to 2 grains on an average of six consecutive week days, or 10 grains upon any one day. It is pointed out that the reduction of the sulphur compounds in accordance with these provisions necessarily causes a nuisance, and moreover is found to be of no advantage to the consumers; and therefore it is considered to be expedient that they should be repealed, and those contained in the Bill substituted for them.

Summarizing the clauses, the illuminating power of the Company's gas is to be 13 candles, tested by Sugg's "London" argand burner No. 1, burning with a flame having an average height of $3\frac{1}{2}$ inches, and with a 6-inch by $1\frac{3}{8}$-inch chimney. The gas is to be deemed to be 13-candle if its illuminating power is 1·3 times that of the Harcourt 10 candle pentane lamp (which is to be the standard for measuring the

light-giving power of the gas, and is to be used with a modified table photometer), when the actual consumption of gas in the burner shall have been calculated back to the rate of 5 cubic feet per hour. The Company are to be liable to a penalty not exceeding 40s. for the first half-candle deficiency; but no forfeiture is to be incurred with respect to any defect of illuminating power or excess of impurity due to unavoidable cause or accident. The Company undertake to supply and fix gratis, at any time within two years after the passing of the Bill, flat-flame burners adapted for producing the best and most economical light obtainable from gas of the illuminating power prescribed. The remaining clauses of the Bill provide that fittings are not to be subject to distress; that gas-engines and other appliances, though fixed to the premises in which they are in operation, are to remain the property of the Company; that the period of error in defective meters is to be the last preceding quarter, unless otherwise proved; and that anti-fluctuators are to be employed by users of gas-engines, if required by the Company to do so.

GAS MATTERS IN WESTMINSTER.

On Thursday, at the Meeting of Westminster City Council, the Works Committee reported that, in view of the early termination of the agreement between the late Vestry of St. Margaret and St. John and the Gaslight and Coke Company for the maintenance and lighting of the public gas-lamps in the parishes, the Committee had considered the question of arranging for the maintenance and lighting of the lamps for a further period, and as to the inclusion of the public gas-lamps in the Parish of St. Martin-in-the-Fields in the proposed arrangement. They had been in communication with the Company as to the matter, and had received from them a draft contract for the maintenance, lighting, &c., of the lamps for a period of five years from Jan. 1 next. The agreement is identical in terms with that recently entered into by the Council for the conversion to the incandescent system of the public lamps in the northern part of the city.

The draft contract was approved, subject to the inclusion of clauses that the Company guarantee that the burners shall pass the stipulated quantity of gas per hour, and that the Council may add to or reduce the total number of lamps.

The same Committee further reported having considered as to the steps to be taken on the termination of the contract with Messrs. Sugg and Co. for maintaining the high-pressure gas-lamps on refuges in Whitehall and Parliament Street. The pressure-increasing apparatus in the Parliament Street convenience and the mains are the property of the Council. The lamps are, however, in the opinion of the Committee, of greater power than is necessary, now that the Scott-Snell installation of 700-candle power lamps is in use; and the Committee suggested that two of the lamps nearest Bridge Street be reduced to single-burner incandescent lamps, and the remaining eight lamps to double-burner incandescent lamps. Tenders having been invited, offers had been received from Messrs. Sugg and Co. and the Gaslight and Coke Company for the maintenance, lighting, cleaning, &c., of the lamps and apparatus in question. The Committee had given instructions that the present hydraulic pressure-increasing apparatus used for the installation be replaced by a small gas compressor at a cost of £39 15s. It was resolved to accept the tender of the Gaslight and Coke Company at £47 per annum.

In another report, the same Committee stated that notice having been given to the various statutory companies and others having power to break up the streets, in respect of the reinstatement requisitions received from them, that the acceptance of a requisition by the City Council to repair does not bind the Council to accept the measurements given therein, and that the requisition is for such repair as may be necessary of a trench opened by the Company at the spot indicated in the notice, letters had been sent to the Committee from the Gaslight and Coke Company and the Postal Telegraph Department to the effect that they cannot recognize any liability beyond the measurements on their requisitions, which are never confined to actual dimensions of openings, but include a margin. The Committee intended to adhere to the position already taken up by them in the matter. The report was adopted.

GAS-STOVES AND THE DECREASE OF FOG.

At the Institution of Civil Engineers last Wednesday, the members of the Royal Meteorological Society held an adjourned meeting for the discussion of the paper by Mr. F. J. Brodie, entitled "Decrease of Fog in London during Recent Years," to which reference was made in the "JOURNAL" for the 22nd ult. (p. 546). It may be remembered that in his paper Mr. Brodie contended that there had been a marked decrease in fog during the past 13 years; and he said that among the numerous agencies which had conduced to this desirable result were the efforts of the Coal Smoke Abatement Society and the more general use of improved gas stoves and grates. Mr. W. Marriott, the Assistant-Secretary of the Society, quoted a number of statistics on the subject of the paper, and illustrated them by lantern slides. He said that much depended upon observers for securing data to work upon, and at present the observations varied very considerably. Absence of wind was a very large factor in the production of fog, and he therefore agreed with Mr. Brodie, who said there was no meteorological explanation of it. Mr. J. E. Clark, who had made day observations in the City, said that his observations seemed to indicate some connection between fog and smoke. The rise and fall of the fog during the day was marked by the increased activity of City office chimneys and those of the restaurants and hotels. The factory chimneys were well looked after; but restaurants and similar places were allowed to send out their volumes of smoke as much as ever, and, on the whole, they were a more important factor in London in producing fogs than factory chimneys. Dr. W. N. Shaw agreed with Mr. Marriott that an important cause was to be found in the variations of the wind. Dr. H. R. Mill said hypotheses were apt to lead to confusion. He suggested that a good plan to deal with the subject would be to go back for 30 or 40 years, and discover the cyclonic and anti-cyclonic conditions which prevailed. Captain W. F. Caborne said he agreed that it was impossible to abolish fog. Sir Oliver Lodge had succeeded in doing so in a small area by means of electricity; but to adopt such a means for the whole of London would be far too expensive. If, however, they could not abolish fog, they could at least have a clean one. In this direction the Coal Smoke Abatement Society had done a good work, although their efforts were necessarily limited through lack of funds. The London County Council had been working with them, and eventually they hoped to secure the co-operation of the Local Government Board. He thought the Society would eventually free London a good deal from smoke, and thus also greatly free it from fog. Replying to the discussion, Mr. Brodie said the present month showed the fogs in London to be below the average; and in the current year there had been only 39 days of fog, which was 16 days fewer than the average. He thought there should be a standard for reporting fog, so as to make a distinction between fog and mist. As things were, it depended very much upon the idiosyncrasies of observers.

WIDNES GAS-WORKS EXTENSIONS.

A Local Government Board inquiry was held by Mr. F. H. Tulloch, last Wednesday, at Widnes, into an application by the Town Council for power to repeal, alter, or amend certain Local Acts, in order to enable the Corporation to acquire land for the purpose of extending the gas-works.

The Town Clerk (Mr. H. S. Oppenheim) said the Council had gone into the matter very carefully, and had come to the conclusion that these extensions were necessary. It was proposed to increase the number of retorts so as to produce 2 million cubic feet per day, instead of 1½ millions. It was also intended to provide a new gasholder. The piece of land which it was proposed to purchase in Earl Street was owned by the United Alkali Company. The latter were not at all anxious to get rid of the whole of the land; and as the Corporation did not require the whole, an arrangement was arrived at whereby the United Alkali Company would retain rent free for ten years the land not immediately required by the Corporation. The present estimate for the new works and land was £49,362; and £5000 would be required for retorts. This made a total of £54,362. The unexhausted borrowing powers were £24,700; so that they required additional borrowing powers, for £29,662. The Engineer (Mr. Isaac Carr) gave evidence of the increased consumption, and said that, despite the decrease in the price of gas, the profits still continued. The Chairman of the Gas and Water Committee (Mr. H. S. Timmis), said there were two schemes—an extension scheme involving an expenditure of £5000, and a new scheme of £49,000.

CHEAPER PUBLIC LIGHTING FOR IPSWICH.

At a Meeting of the Ipswich Town Council last Wednesday, the Paving and Lighting Committee presented the following report.

The present contract with the Gas Company will expire on the 31st inst. The price per lamp for the ordinary "C" incandescent burner at the time when the last contract was entered into was £3 3s. where the column, &c., belonged to the Gas Company, and £3 2s. per lamp per annum where the column, &c., was the property of the Corporation. For the No. 7 Kern burners, all the lanterns and columns of which belong to the Corporation, the annual charge was £5 18s. per lamp. During the currency of the present contract, the price of gas was reduced from 2s. 8d. to 2s. 6d. per 1000 cubic feet; and the Corporation, in accordance with the terms of the contract, received the benefit of such reduction. Subject to the approval of the Council, your Committee have agreed that the contract should be renewed for a further period of two years from the 31st inst. at the following charges per lamp per annum: For "C" incandescent burners, where the column, &c., belong to the Company, £3. For "C" incandescent burners, where the column, &c., belong to the Corporation, £2 19s.. For No. 7 Kern burners, £5 12s. The contract will also contain a clause that if the price of gas should be again reduced, the Corporation shall benefit accordingly.

Mr. Raffe, in proposing the adoption of the report, said that, in addition to the reduction in price of gas, which the Council shared in common with other customers, the Company were prepared next year to take off 1s. a lamp for maintenance. The entire reduction was 3s. per lamp on the "C" burners, and 6s. per lamp on the Kern burners, including the 1s. to which he had referred.

INFRINGEMENT OF THE "A.V.I.L." COMPANY'S PATENT.

At the Liverpool Assizes last Saturday week, Mr. Justice Walton delivered judgment in a case heard by him at Manchester last month (see "JOURNAL" for Nov. 29, p. 710), in which the Anti-Vibration Incandescent Lighting Company sought an injunction to restrain the defendant, Mr. B. Crossley, of Burnley, from infringing their patent relating to improvements in the suspension of incandescent gas-lights. Damages were also claimed. His Lordship said the question discussed before him was as to the validity of plaintiffs' patent. It was alleged that the invention alluded to was not an invention at all, but that it was merely an application of old devices to an ordinary and obvious use. As against this, plaintiffs contended that, though the devices used, taken separately, were old, and none of them were invented by plaintiffs, still they were combined to form a new combination, and, so combined, were applied to a new and useful purpose; that the application

of this combination was not obvious to everybody to see; and that the combination and application involved invention. Plaintiffs' combination was no doubt new and good subject-matter for letters patent in so far as it required invention to discover it. Incandescent burners needed the use of very delicate and fragile mantles; and where an incandescent mantle was exposed to vibration, it was apt to perish rapidly. The object of plaintiffs' invention was to reduce the vibration. He had no doubt that the way plaintiffs had obtained letters patent was very satisfactory; and he did not think it had been made out that this combination of the flexible pipe and flexible burner was ever in use before, but that it was invented by plaintiffs. He thought that the combination required invention to produce it, and such invention as was sufficient to make it subject-matter for letters patent. Therefore his judgment would be in favour of the plaintiffs, who were entitled to an injunction, to an inquiry before an Official Referee as to damages, and to a certificate as to the validity of their patent. With regard to the inquiry as to damages, he did not wish to refuse to the defendant the right to raise the question of delay in the bringing of the action; and he could not decide this point without knowing more of the reasons why proceedings in the matter were not taken earlier than they were. He thought the better plan would be for him to adjourn the consideration of this point, so that defendant might apply to have the question of damages limited to the time since the date of the action, or whatever date he might choose. Unless such an application was made, judgment would be in the usual form as to damages. On the application of defendant's Counsel, stay of execution was granted for twenty-one days.

ELECTRIC STREET LIGHTING IN AMERICAN CITIES.

Proposed Municipal Plant for New York.

The following statistics showing the cost of electric lighting in American cities, which were given in the "Electrical Review" for the 18th inst., will be of interest to our readers.

The Board of Aldermen of New York on the 2nd inst. passed a resolution calling for the preparation of documents enabling the city to install and operate municipal electric lighting plant, plans for which have been under discussion since March. Public electric lighting commenced in Manhattan in 1881, at $225·50 per lamp. The price gradually decreased until 1890, since which year it has remained steady at $146 per 2000-candle arc lamp. The following shows the cost per 2000-candle street arc lamp of the more important American cities, for underground and overhead services respectively: New York, $146, $146; Chicago, $137·50, $103; Boston, $120·45, $120·45; Philadelphia, $110·56, $110·56: Providence, $109·50, $109·50; Baltimore, $99·92, $99·92; Milwaukee, $99, $81; Jersey City, no underground, $97·50; St. Louis, $96·38, $96·38; Newark, $95, $95; Pittsburgh, no underground, $96; New Orleans, $90, $75; Louisville, no underground, $84; Washington, $80, no overhead; Cleveland, $75, $75; Los Angeles, no underground, $81.

The general conditions as to hours, cost of fuel, proportion of underground and overhead wiring, &c., for New York are at about the average of the other cities, except that New York's contract has to be made annually. After tabulating and analyzing the data, Mr. C. F. Lacombe, the City Engineer or Surface Construction, concludes as follows: (*a*) That the city is a very large consumer of electricity for lighting, and also of gas (costing $1·20 per 1000 cubic feet); (*b*) that the prices now paid are very high, and that at the existing rates it will be difficult to find enough money to keep pace with the growing needs of the city's lighting; (*c*) that New York pays a higher price per lamp under similar conditions than any other city, and nearly the highest price for gas; (*d*) that relief from the present high charges is impossible under present conditions, there being no real competition among the Companies. Mr. Lacombe also shows that New York, using 4748 arc lamps of various candle power, pays from $125 to $146 per lamp per annum, whereas Evansville, Indiana, with 300 lamps, pays only $60 a lamp. Of the 175 cities given, 91 buy their energy from public companies, 68 of which use lamps of 2000-candle power, at an average price of $88·60; Evansville (Ind.), being the lowest, and Haverhill (Mass.) the highest, at $125 per lamp. Six of the cities operate their own electric lighting plant, at an average cost of $66·45 per lamp; ranging from $47 at Columbus (Ohio) to $96 at Jacksonville (Florida). Mr. Robert G. Monroe, the former Lighting Commissioner, attributed the high charges partly to the over-capitalization of the local Companies; the New York Edison Company having a total capitalization of $85,338,000, against an original capital of $30,214,100 of the Companies now consolidated under the above title.

The total cost to the New York Edison Company for generating and distributing energy is probably less than 3 c. per kilowatt-hour at the lamp terminal. A pair of lamps, such as are used on Fifth Avenue, take about 750 watts, and consume in one year, on the basis of 4000 hours' burning, 3000 kilowatt hours, equivalent to $45 per single lamp. The difference between $90 per pair and $182·50 (as bid for 900-candle lamps per pair) includes maintenance, interest, and profit. The total cost of maintenance should not, at the outside, be $10. The estimates for a complete installation for public lighting in New York City—that is, for streets and public buildings, it not being proposed to sell energy to private consumers—amount to $1,375,000 for the central station, or equal to $137·50 per kilowatt-hour, or more than the cost of the plant operating the New York subway. The estimated cost of the plant is $4,208,000. Of this total, $3,006,000 is assigned to the cost of arc lamps, and $1,202,000 for incandescent globes, or an average cost per arc lamp of $300·60, and $300·50 per incandescent lamp. The cost of generation and distribution is given at $367,500 per annum, based on a comparison of the statistics of the local electric companies, or an average cost of 1·27 c. per kilowatt-hour. With energy at this price, and allowing $5 for maintenance, $20·20 for depreciation, and $10·50 for interest, the total cost per annum for each 2000-candle arc lamp would amount to $66·10. With similar allowances, the cost per kilowatt-hour for each incandescent lamp would be 5·475 c. There would, therefore, be an estimated annual saving to the city of $507,000, arrived at as follows:—

	Present Rates.	City Plant.
5000 arc lights	$730,000	$404,000
Incandescent lamps, 4,000,000 kilowatt-hours	400,000	219,000
Total	$1,130,000	$623,000

The resolution endorsing the above estimates was passed with only one dissentient, whose objection was that it did not include a proposal for supplying energy to private consumers.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 971.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p.c.	13½—14½	..	5 3 5
200,000	5	Nov. 11	6½	Bombay, Ltd.	6—6½	..	5 0 0
140,000	5	,,	6½	Do. New, £4 paid	4½—5	..	5 4 0
50,000	10	Aug. 31	14	Bourne- 10 p.c.	29—30	..	4 13 4
251,810	10	,,	7	mouth Gas B 7 p.c.	15½—16½	..	4 4 10
53,200	10	,,	6	and Water Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	245—250	..	4 16 0
300,000	,,	,,	9	Do. New	187—192	..	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	105—108*	..	3 14 1
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	222—227	..	4 16 11
246,320	,,	,,	8	Do. A. Ord. Stk.	163—168	..	4 15 3
460,000	20	Sept. 29	10	British	40—41	..	4 17 7
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c.	117—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	92—96	..	4 13 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11¼—11⅝	..	5 19 2
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
150,000	20	July 14	8¼	Cagliari, Ltd.	24—26	+1	6 6 11
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	15—15½	+¼	6 9 0
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.	9¼—9⅝	..	4 12 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	101—103	+1	4 7 5
1,375,000	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk.	113—115	..	4 10 5
560,000	,,	,,	5	Do. 3½ p.c. do.	110—113	..	4 8 6
450,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	85—87*	..	3 9 0
800,000	Stk.	,,	6½	Continental Union, Ltd.	114—117*	+1	5 11 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—141*	..	4 19 3
486,090	10	July 14	11	European, Ltd.	20—21	..	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	14—15	..	5 10 0
15,243,200	Stk.	Aug. 12	4¼	Gas- 4 p.c. Ord.	99½—100½	..	4 7 6
2,600,000	,,	,,	3½	light 3½ p.c. max.	91—93	..	3 15 3
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	109—111	..	3 12 1
4,193,975	,,	Dec. 15	3	Coke 3 p.c. Con. Deb.	86—88*	..	3 8 2
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	15—16	..	6 17 6
3,800,000	Stk.	Nov. 11	10	Imperial Continental	206—208	..	4 16 2
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	117—122	..	4 18 4
561,000	Stk.	Aug. 31	10	Liverpool United A.	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B	159—161	..	4 6 11
306,083	,,	June 29	4	Do. do. Deb. Stk.	108—110	..	3 12 9

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	Dec. 15	5	Malta & Medn., Ltd.	4—4½*	..	5 11 1
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd.	10—11	..	6 7 3
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	109—110	..	4 1 10
406,125	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	145—149	..	5 7 5
600,000	5	Sept. 15	7	Ottoman, Ltd.	5½—6½	..	5 12 0
235,005	Stk.	—	6⅔	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord.	5½—5¾	..	4 6 11
796,980	5	July 28	5	Do. 5 p.c. Pref.	4¾—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
851,070	10	Oct. 13	7	River Plate Ord.	11½—12	..	5 16 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 15	6	San Paulo, Ltd.	12—12½	..	4 16 0
70,000	50	June 29	5	Do. 5 p.c. Deb.	53—55	..	4 10 11
135,000	Stk.	Sept. 15	10	Sheffield A	238—240	..	4 3 4
209,984	,,	,,	10	Do. B	237—239	..	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrewsbury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	150—152	..	4 3 4
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	89—91	..	3 5 11
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	122—125	..	4 8 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133—138	..	3 12 6
502,310	Stk.	Nov. 11	5	Southampton Ord.	105—107	+1	4 13 6
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6½	Tottenham A 5 p.c.	122—127	..	4 18 5
325,520	,,	,,	4½	and B 3½ p.c.	95—100	..	4 15 0
115,000	,,	Dec. 15	4	Edmonton 4 p.c. Deb.	102—105*	..	3 16 2
182,380	10	,,	8	Tuscan, Ltd.	8⅜—9*	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
30,000	Stk.	Aug. 31	7½	Wands- A 5 p.c.	160—165	..	4 13 11
255,636	,,	,,	6¾	worth B 3½ p.c.	130—135	..	4 12 7
51,299	,,	,,	5⅛	and C 3½ p.c.	110—115	..	4 13 6
57,564	,,	June 29	3	Putney 3 p.c. Deb. Stk.	78—83	..	5 12 8
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord.	99—101	..	4 19 0
85,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
160,000	,,	June 29	4	Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div

GRAND JUNCTION WATER-WORKS COMPANY.

A General Assembly of the proprietors of this Company was held last Wednesday, at the offices, No. 65, South Molton Street, W.—Viscount KNUTSFORD in the chair.

The SECRETARY (Mr. J. Goodwin) read the notice convening the meeting, and the report of the Directors was taken as read.

The CHAIRMAN said the first paragraph of the report related to the compensation awarded by the Court of Arbitration to the Company for their undertaking. It was very satisfactory to know that the amount payable to them in water stock reached £3,210,000; and of this there had been already distributed no less than £3,123,625. As to the sum payable in cash, it was £120,325, of which £104,807 had been already distributed to the shareholders who desired to have it instead of water stock. The Board had been unable to circulate the accounts for the quarter ended the 24th of June. Being the final accounts, their completion had necessarily been delayed, and they had not yet been certified by the Government Auditor. So soon as he had given his certificate, the balance available for dividend would be paid over to the Company by the Water Board, and warrants would be distributed in the ordinary way. The dividends would be at the rate of 7 per cent. per annum on the "D" shares, and at 7½ per cent. on the "A," "B," and "C" shares; and then the surplus would be devoted first to making up 10 per cent. dividends upon the "A" and "B" shares, and if there remained anything over it would be divided between the "A," "B," and "C" shares. As a "C" shareholder, he did not anticipate getting anything upon these shares in addition to the 7½ per cent. The interest paid by the Water Board for the period between June 24 and Sept. 1 last amounted to £20,545; and it was to be distributed at the rate of 9 per cent. on the "A" and "B" shares, 7½ per cent. on the "C" shares, and 7 per cent. on the "D" shares. The question would probably be asked as to when the warrants would be distributed for the payment of the dividend and interest. It was not anticipated that any difficulty would arise between the Government Auditor and the Company to create any delay, and therefore he thought the warrants and the interest would be issued before the end of January—roughly, about a fortnight later than the usual time for issuing these warrants. Of course, the Board could not undertake to say that the Government Auditor would not raise some objections to which they could not assent. If this were done, and they found themselves obliged to dispute them, they would have to refer the points to a Court of Arbitration, and this might occasion some delay. The Directors would in that case approach the Water Board, and ask that money might be advanced with which to pay, at all events, an interim dividend. The Company's cash assets were handed over to the Board on the 24th of June, and they had received all the water-rates for the quarter ended at that date. At a very moderate calculation, the Directors thought the net profits for that quarter amounted to about £27,000. The dividends recommended in the report would require about £24,000; so that, though the Water Board were bound to keep in their hands a sufficient sum to meet contingencies, he thought there could be no hesitation on their part in paying an interim dividend of some large amount. The compensation payable to the Company in cash was £120,325. This amount was lodged immediately with the Bank of England. It was on deposit, and was invested in temporary loans and earned a certain amount of interest—not very much, but it was better than leaving the money idle. He concluded by moving the adoption of the report, together with the recommendations contained therein.

Mr. H. MOTT seconded the motion.

The CHAIRMAN said, before putting the motion, he wished to mention that this was probably—almost certainly—the last general meeting of the Company; and he desired, on behalf of the Directors, to express their thanks for the confidence which the proprietors had so long placed in them. He desired also to refer to the excellent work so loyally done by the Secretary and his staff, and by all the employees. The work had been very great, particularly the last two or three months; but it had been done ungrudgingly.

The motion was carried unanimously; and resolutions were passed approving the payment of the dividends recommended.

Mr. WHITWORTH, speaking as one of the largest shareholders, moved a vote of thanks to the Directors for their management of the Company's affairs. He said he was desirous of taking this opportunity of expressing the confidence which he had in the Board, because he was one of those who took an active part in opposing the scheme they put before the proprietors. Neither he nor any of the gentlemen with whom he was associated in leading that opposition had any intention of suggesting that the Directors did not act according to what they believed to be just and right. A point of law was involved, which he regretted was prevented from going before what he considered to be the proper tribunal for deciding it.

Mr. M'LEAN seconded the proposition, and said he had always felt the greatest confidence in the control of the business by the Directors.

The proposal was agreed to.

The CHAIRMAN acknowledged the compliment, and said he wished to state that their thanks were very much due to their Solicitor (Mr. Bonnor-Maurice), who had given them the best advice, and had conducted their affairs in connection with the arbitration proceedings with the greatest skill and judgment. Continuing, he remarked that the position of the Company when taken over by the Water Board was better than it had ever been since its foundation. They had reached the point of paying a dividend of 10 per cent., and, so far as could be judged, there was a probability that they could have begun to pay back-dividends. There was every reason to be gratified with the success the Company had attained, and with the position the undertaking held among the other Water Companies; and he regretted that the friendly relations which had so long subsisted between the Directors and the shareholders must now come to an end.

The proceedings then terminated.

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	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

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TEIGNMOUTH WATER SUPPLY.

The Main from Paignton.

The proposal that the main for bringing the new water supply to Teignmouth should be laid through the chief street of Newton Abbot, to which reference was made in the "JOURNAL" for the 13th inst. (p. 861), was considered at a recent meeting of the Newton Abbot Urban District Council. Most of the members were opposed to it, on the ground that the roadway was already much occupied with their own water, gas, and electricity mains and services. One member suggested that it might be wise to keep on friendly terms with Teignmouth, in view of the possibility of Newton Abbot, which is now served by the Torquay Corporation, requiring an additional supply of water. It was, however, decided to inform the Teignmouth District Council that, although the Newton Abbot Council were prepared to receive a deputation, they would be obliged to offer strenuous opposition to the carrying of the pipes through the main streets. This reply was laid before a meeting of the Teignmouth District Council on Tuesday, and it was decided to drop the proposal to go through Newton Abbot. With reference to the remark that Newton Abbot might want a supply of water from Teignmouth, the Clerk said he should be surprised if the former town could get out of the agreement with the Torquay Corporation. If it should be broken, Torquay would be left with a big undertaking on its hands, and its principal customer gone. Mr. Banbury proposed the adoption of the fourth of the alternative routes recommended by the Surveyor (Mr. C. F. Gettings). The length of this route is 10⅝ miles; and the estimate by Mr. Gettings of the cost is £21,150. Mr. Alsop regretted that they could not take the most direct route through Newton Abbot. As they could not do so, the scheme now proposed was the best. He thought, however, they ought to get expert advice, in order that they might understand why the estimate of the cost had increased from £11,000, at which it was put by the late Surveyor, to £21,000. Mr. Hayward said the present estimate was no doubt nearer the mark, for the pipes alone would cost £10,250. The Clerk said the late Surveyor's estimate was a rough guess that the cost would be £1000 per mile. He simply drove over the ground and put it at this figure, and had since said he had no doubt Mr. Gettings' figures were right. It was decided to adopt the proposed route; it being understood that an expert may be called in at a later stage.

Southport Gas Finances.—It is estimated that at the present rate of progress (a profit of £966 on the summer half year), there should be a total profit of £12,500 or £13,000 on the twelve months, compared with £10,000 last year. The gross profit on the half year is £7425, compared with £5395 in 1903. There is a total expenditure of £20,478, against £20,917, and an income of £27,903, compared with £26,312. In manufacture there is a slight increase, due to the additional make of gas; the figures being £14,136, against £13,929. Gas-rents have gone up from £19,919 to £20,649, and residuals from £4535 to £5266.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

These will be the last "Notes" which you will publish in 1904; and, following my practice of late years, I shall endeavour to recall some of the more prominent events with which I have had to deal during the year. I dare say it will be readily accepted that the most eventful of all was the opening of the Provan Gas-Works of the Glasgow Corporation in September. No works of the size have ever been brought into use in one day, in Scotland at least. Even the size of the works makes the occasion memorable; but there are other considerations connected with these works which make them now, and will for many a day make them, occupy a large place in the mind's eye of everyone interested in the gas industry. These were fully recounted at the time of the opening, and need not be repeated; but it may be added that the works are in every way fulfilling the high expectations which were formed of them. Besides Provan, there were new gas-works opened at Kilmarnock and North Berwick. These events are sufficient in themselves to show that there is no idea at all of going back, but quite the opposite, in matters of gas supply. At the present moment, there are other two brand-new works in progress of erection—at Peebles and Falkirk. At the Granton works in Edinburgh, too, there is a very large extension being erected.

Of transfers I can recall only one—that at Airdrie—which was consummated last month in an exceedingly harmonious manner, which is not usual. A transfer at Monifieth is at present hanging in the balance.

There have been few matters of general interest before gas communities. Perhaps the one which has been of most moment has been the formation of a Junior Gas Association for Scotland, an institution which has already fully justified its existence, and which there is every reason to expect will continue to hold the high place it has taken at the start of its career. The North British Association of Gas Managers declined to enter into affiliation with the Institution of Gas Engineers; being in this respect the only exception. It is a happy feature of the incident that it has not been accompanied by anything like ill-feeling on either side. A large installation of plant for the manufacture of carburetted water gas was inaugurated at Dundee in the course of the autumn. I am not aware that the process is regularly in operation at any other gas-works in Scotland. Incandescent gas lighting has been greatly extended, both for private and public purposes. As to the latter, the Corporation of Glasgow have resolved to entirely abolish flat-flame burners in street-lamps, and to substitute incandescent burners, at the same time fitting up new square lanterns on all the lamps. In Edinburgh, one-fifth of the street-lamps are being converted into incandescent lights; and the results will guide the Corporation in considering whether they will go on and convert the remainder. In Edinburgh, a good deal of attention has

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been attracted to the question of municipal trading, on account of the objection of the plumbers and ironmongers to the Gas Commissioners dealing in and fitting up gas stoves, fires, and other appliances. The agitation has come to an end without having effected any change in the policy of the Commissioners.

There have been few changes in the *personnel* of the body of gas managers during the year. In January, the Corporation of Glasgow appointed Station Managers to their works at Dawsholm and Tradeston, which were vacant, and to Provan, which was nearing completion. Mr. T. D. Hall, of Montrose; and Mr. G. Keillor, of Nairn, tendered their resignations; and their places have been filled—the former by Mr. J. Mackay, from Glasgow, and the latter by Mr. J. Barker, from Greenock. At the beginning of the year Mr. J. Gibson, of Dalmellington, was appointed Manager of the Kircudbright Gas-Works. The ranks were not broken by the death of any manager in active service; but four who were on the retired list passed away—Mr. Alex. Millar, formerly of Carnoustie, Mr. G. T. Myers, formerly of Broughty Ferry, Mr. P. Watson, formerly of Stirling, and Mr. David P. Young, late of Dalkeith.

Coal has again been cheaper than it was in 1903. It went down shortly after the year commenced, and remained low till quite recently, when it advanced in price. The year closes with prices almost on a level with what they were when it began. At the time when gas coal contracts were being entered into, the prices were low; the year's supplies for the Edinburgh and Leith works having been secured at about 7d. per ton less than in the previous year, while the prices for the Glasgow supply were from 2d. to 3d. per ton down.

There has been again an increase in the output of gas in nearly every works in Scotland. In Glasgow, it was as large as 87 million cubic feet; in Edinburgh, it was 33 million cubic feet; in Dundee, 32½ million cubic feet; and in Aberdeen, 7½ million cubic feet. Reductions in price were more numerous than can be detailed.

Altogether, though there may not have been anything of a startling or outstanding nature transpiring, the year has been a kind one to the gas industry. It has been a year of steady application to work. In a sentence, it may be said that everyone had his coat off; and let us trust that the reward is being found, or will be, in that which we are told comes to the hand of the diligent.

The unfortunate motor car accident to H.R.H. the Duke of Connaught, in Portobello Road, Edinburgh, on the evening of October 13 last, has had the effect of stirring up the Town Council of Edinburgh in the matter of the lighting of that thoroughfare. At a meeting of the Town Council on Tuesday last, the Cleaning and Lighting Committee recommended that the portion of the road between Piershill and Portobello, which is at present lighted by flat-flame gas-burners (the other parts being lighted by electric arc lamps), be lighted by incandescent gas-lamps. Bailie Mallinson, the Convener, moved adoption of the recommendation. He said there were two ways by which the lighting could be improved—either by electric light or incandescent gas. If they adopted incandescent lighting, the additional annual charge would be £16 13s. 4d., and for electric lighting, it would be £160. On the ground of economy, they decided to recommend incandescent lighting after their experience of gas lighting. Mr. Carmichael moved recommittal. The report of the Convener was neither full nor accurate; and the statement that there would be an increase of £160 on the charge was not correct. Mr. Stevenson, the Convener of the Electric Lighting Committee, said this was the only remaining portion of the tramway route which was not lighted by electric light. The 42 lamps which it was proposed to put up would not be sufficient to light the place properly. While the charge for electric lighting would be £120 more than for gas, it would give four-and-a-half times more light. Bailie Mallinson, in reply, said that every city in the United Kingdom had practically ceased to extend electric lighting, and in some places they were substituting for it incandescent gas. He was not opposed to electric light; but he was convinced that incandescent gas was an efficient light for public thoroughfares, and it was much cheaper than electric light. The Committee were keeping a record of every gas mantle put up, and he would be able to give the Council the results at the end of the year. By a vote of 23 to 16, the Council adopted the recommendation of the Committee.

The Edinburgh and Leith Gas Commissioners met on Monday—Provost Mackie, of Leith, in the chair. Bailie Bryson, the Convener, stated that the Works Committee had that day had before them estimates for purifiers at Granton; and they recommended that the tender of the Whessoe Foundry Company, Limited, of Darlington, be accepted. For the roof of the purifier-house, they recommended acceptance of the offer of Messrs. Redpath, Brown, and Co., Limited, of Edinburgh. These recommendations were agreed to. Regarding the Stoves Committee, they had had a meeting that day, and had sent the matter back to the Engineer to submit a tabulated statement regarding the various articles for sale, and the discounts to be given to the traders who wished to deal with them. Mr. Pennell moved, in terms of notice he had given, that it be remitted to a Sub-Committee to consider and report as to the advisability of now adding to the efficiency of general private lighting by incandescent or other approved means, and as to how that could best be accomplished by the Commissioners. The object of the motion, he said, was to promote more generally an improved method of private gas lighting. The Chairman suggested that the motion be sent to the Works Committee to consider. Bailie Douglas asked if there was any use in their sending the subject to the Works Committee. He might say that for public lighting the recent introduction of incandescent lighting had led to a grand development of the business of the Gas Commission, and he believed that no form of lighting in private would aid them in the slightest. He might say, from his own experience, and from an experience of the trade generally in Edinburgh, that, since the introduction of incandescent gas lighting in the public lamps, private incandescent lighting had gone up by leaps and bounds. The remit was agreed to.

The meeting of electors of Monifieth, to which I referred last week

as about to be held prior to the poll upon the question of a gas transfer, was held on Wednesday evening. It is reported that there was a large attendance of ratepayers. Provost Stewart occupied the chair. He said he would say nothing, either one way or another. The members of the Town Council who were shareholders of the Gas Company were to take no part in the negotiations for the purchase of the undertaking; and the Committee who had been appointed to see the matter through had no interest, beyond the public interest, to serve. Mr. Fenton entered his humble protest against the manner in which the opposition had been got up. At present the price of gas in Monifieth was 6s. per 1000 cubic feet, and although, if they adopted the Acts, he could not promise that this would be reduced right off, he did say—and he challenged contradiction—that, if the Council had had the running of the concern, they most certainly would have been able to supply gas at 5s. per 1000 cubic feet. Mr. J. Crichton having put the question why circulars had not been sent out to every elector, as promised, was assured by Provost Stewart that a card was sent to every elector. In the course of further discussion, the question arose as to whether there was any possibility of the electric light being introduced into Monifieth when the tramway was completed, and was answered in the negative. The proceedings then terminated, without any motion for or against adoption of the Acts. The poll takes place on the 27th inst.

The Forfar Town Council, at their monthly meeting on Wednesday, discussed at considerable length a recommendation by the Gas Committee that the salary of Mr. Jas. Baxter, the Gas Manager, be increased by £15 a year. Mr. M'Dougall, the Convener of the Committee, in moving the recommendation, said that since Mr. Baxter was appointed Manager the price of gas had been considerably reduced, while, despite the fact that most of the factories in the town—the largest consumers—were now lighted by electricity, the consumption had steadily increased. After some discussion, the increase was granted by nine votes to six.

The proportion of carburetted water gas in coal gas was a subject of remark at a meeting of the Gas Committee at the Dundee Town Council last Wednesday. It was brought up by the receipt of a circular from the Liverpool Corporation suggesting that the Board of Trade should be approached with a view to obtaining from Parliament an order limiting the percentage of carburetted water gas. It was alleged in the circular that several gas companies in Liverpool and district were putting as much as 50 per cent. of carburetted water gas into coal gas, and that this was considered a highly dangerous quantity. Mr. Stevenson, the Convener of the Committee, said that the Gas Manager in Dundee had fixed the limit of carburetted water gas at 25 per cent.; but this percentage had never been reached—indeed, at the end of last month it was as low as 15 per cent. The Committee expressed great satisfaction at the state of affairs.

There was another explosion in an electric cable conduit in Dundee on the evening of Saturday last. The occurrence took place in Blackness Road, about ten o'clock. A manhole cover was blown off, and there issued a great cloud of black smoke, but no flame. Nobody was injured; but for about an hour it was necessary to conduct the tramway traffic upon a single line of rails.

The water supply of Arbroath continues to be a subject of anxiety to the Town Council. Notwithstanding endeavours to reduce the consumption by cutting off the water supply at night, the water in the well has continued to go down. In the circumstances, the Water Committee have been considering if it be possible to get an auxiliary supply, not only for present needs, but to endure till the new supply be got in from the Noran. A Sub-Committee has been appointed to look into this matter.

The reservoir from which the water supply of Galashiels is obtained has been leaking for a long time; but in the course of the past few months a new leak has developed. On account of the serious nature of the situation, the Town Council requested Messrs. J. & A. Leslie and Reid, of Edinburgh, to examine the embankment of the reservoir and to report. The report of the firm was submitted at a meeting of the Council this month. It was to the effect that borings had been made, which disclosed that water was passing through the puddle wall in the embankment about 26 feet up, which was probably the new leak. They suggested that the wall should be excavated at the place to a depth of 25 feet, and the puddle wall renewed, at a probable cost of £5200, or that the wall be excavated to the bottom and renewed at a cost of £2200, but they were not prepared to guarantee that this estimate would be even tolerably correct; and they were further of opinion that, owing to the open nature of the rock, neither of these schemes would altogether stop the leakage. They therefore suggested that the bed and sides of the reservoir might be covered with bitumen sheeting; and if this were resolved upon, they would prepare an estimate of the cost. As against the proposal to spend money in the repair of the reservoir, they thought the Council should consider whether they would not construct a new reservoir at a higher level. The Water Committee recommended that Mr. W. A. Tait, of Messrs. Leslie and Reid, be asked to meet the whole Council and discuss the situation with them. This recommendation was unanimously agreed to.

The Sutherland Gas-Meter Company, Limited, has been registered with a capital of £100,000, in £1 shares, to acquire the business of the Sutherland Meter Company, Limited; to adopt an agreement with that Company and Mr. A. G. Sutherland; and to carry on the business of meter manufacturers, engineers, ironfounders, contractors, &c.

The annual dinner of the employees at the West Greenwich works of the South Metropolitan Gas Company took place at the Gas-Works Institute on the 17th inst., under the presidency of Mr. J. F. Braidwood, the Engineer in charge of the station. The company numbered about 110; among the guests being Messrs. Austin, Butcher, and Drumgold (Directors). A varied programme was gone through; and during the evening the President presented the prizes won by members in various games. Thirteen of the oldest servants of the Company each received a present of a pipe and a packet of tobacco.

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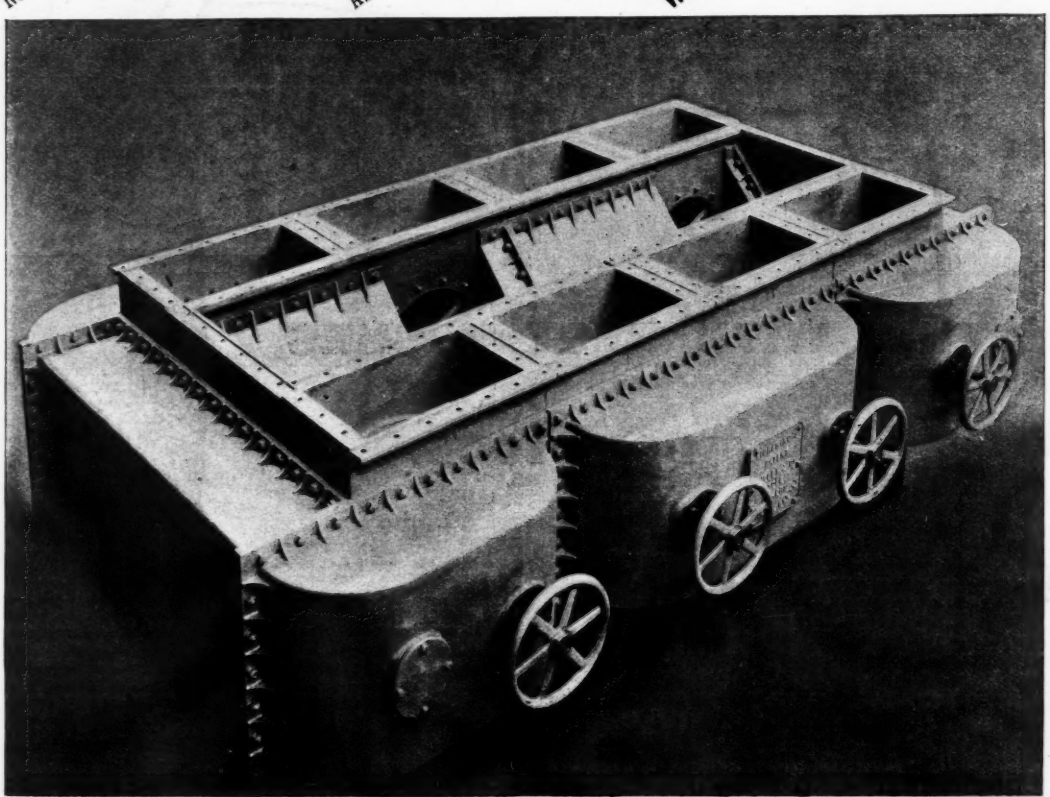

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 24.

Sulphate of Ammonia.

The market continues quiet, and although there has been a fair amount of buying going on, it has been barely sufficient to sustain prices. The closing quotations are consequently £12 12s. 6d. per ton f.o.b. Hull, £12 16s. 3d. per ton f.o.b. Liverpool, and £12 17s. 6d. per ton f.o.b. Leith. In the forward position, the firmness of makers has practically precluded first-hand business, and as speculators seem shy about offering ahead unless at a substantial premium on spot prices, there is nothing special to report.

Nitrate of Soda.

This article is firm, and spot prices remain 11s. and 11s. 3d. per cwt., for ordinary and refined qualities respectively.

LONDON, *Dec.* 24.

Tar Products.

There has been very little business doing during the past week; and as a rule prices are a trifle easier. There is absolutely nothing fresh to report in anthracene. Makers are not at all inclined to offer for forward at anything like the prices mentioned by consumers. It is probable, therefore, that there will be no alteration in the position of this article for some time to come. Benzol is decidedly easier. Some 90 per cent. is reported to have been sold at 10d. per gallon in the North; while there are certainly sellers at 10½d. f.o.b. London. In 50-90 per cent, there is nothing doing for early delivery; but there are several inquiries for shipment all over next year. The position in toluol remains unchanged; but there is practically nothing offering for either prompt or forward delivery. In solvent naphtha, the market has been quiet during the past week, which is not unusual at this time of year. In pitch, the largest London producers still quote 38s. 6d., which is, however, rather a high price compared with those ruling in other quarters. There are several inquiries from South Wales for delivery all over next year; but consumers' ideas of prices are certainly less than those which either dealers or manufacturers are prepared to consider at present. It is quite clear that the production of patent fuel has very largely increased in South Wales during the present year—over 250,000 tons more having been shipped up to the end of November than was the case during the same period of last year. It remains to be seen whether this increase will be maintained in 1905, as, should this be the case, pitch should certainly be firmer, especially in the Midland district. In Belgium, there is really no demand, which is not surprising at this time of the year. Probably consumers will not consider further contracts until after the New Year. There is a steady business still doing in carbolic acid, especially for January-February delivery, for which 2s. 3d. has been paid; while it is reported that in one instance 2s. 3½d. was realized. Consumers, however, do not seem at all inclined to purchase further forward, although after the New Year it is quite possible that they may reconsider their decision, as the demand for crystals appears to be fairly good to the end of June, and prices have steadily improved during the last three or four weeks. Creosote continues very quiet; and there is more offering in London for early delivery. Some makers still maintain their quotation at 2d. per gallon; but there is no difficulty in buying oil of very good quality at 1⅞d.—in fact, at the present moment, consumers only offer at 1½d. to 1⅝d. In the North, further business was done at 1¼d. for delivery over the first six months of next year at makers' works in Yorkshire, although as a rule sellers ask rather more than this.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 37s. to 37s. 6d.; east coast, 34s. 6d.; west coast, 33s. 6d. to 34s. 6d. Benzol, 90 per cent., 10½d.; 50-90 per cent., 8½d. Toluol, 7½d. Crude naphtha, 3½d.; solvent naphtha, 8½d. to 9d.; heavy naphtha, 10d. Creosote, London, 1⅜d. to 1 11/16d.; North, 1¼d. to 1 5/16d. Heavy oils, 2⅛d. to 2¼d. Carbolic acid, 60 per cent., 2s. 2½d. to 2s. 3d. Refined naphthalene, £4 to £8 10s.; salts, 20s. to 21s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market continues very quiet, and there is really little or no business doing. So far as the London market is concerned, the position remains unchanged. The nominal quotation of both Beckton and the South Metropolitan Company is still £13 10s., at which price business is impossible at present. In Hull, business is reported at £12 17s. 6d. for shipment at the end of December and early in January, but only for small quantities, and consumers will not pay more than £12 15s. for prompt. The quotation in Leith still remains £13 for early shipment; but buyers decline to pay this price—in fact, they are not at all anxious to purchase just at present. It seems now quite probable that no business of any importance will be done until the New Year; and, consequently, prices may be a little easier during the next week or two.

Bilston Gas Company.—The report which will be submitted at the annual meeting of the Bilston Gas Company, to be held on the 2nd prox., states that the profit and loss account, after paying the usual interim dividends, shows a balance of £4643. From this amount, it is proposed to pay dividends of 5s. 6d. and 4s. per share on the "A" and "B" shares respectively, making with the interim dividends 11s. and 8s. for the year, and leaving a balance to be carried forward of £1958. A reduction in the prices of gas supplied for power purposes was made in the early part of the year, and a reduction in the charge for lighting purposes at the end of the Michaelmas quarter. The lighting of the public lamps has been taken over from the Bilston Urban District Council, and the whole of the lamps furnished with incandescent burners—an arrangement which has effected a great improvement in the street lighting, and one which it is believed is much appreciated by the public.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

No weather could be more favourable for the coal market than Lancashire has been experiencing for the past month. Latterly fogs have enveloped the county day after day. Beyond a general firmness with respect to most of the departments for which coal is required, there is nothing more to report. Prices remain without practical alteration. The supply of slack is now abundant; and, consequently, there is less need than two months ago to make it dearer to buy. The demand for house coal is a little stronger; but it does not yet realize expectations on the part of colliery proprietors, or even the middlemen. Quotations are: Best house coal 13s. to 14s. at the pit, secondary 11s. to 12s., common 9s. to 10s., best slack 6s. 6d. to 7s., secondary 5s. to 5s. 6d., common 4s. 3d. to 5s., steam and forge coal 8s. to 8s. 6d., and secondary a little cheaper.

Northern Coal Trade.

There is now considerable activity in some of the branches of the coal trade of the North. The steam coal branch, however, is rather quiet, and some of the collieries are working short time. Best Northumbrian coals are 9s. per ton f.o.b., second-class steams are 8s. to 8s. 3d., and steam smalls are 4s. to 4s. 6d. In gas coals, there is great activity, both for prompt delivery and in forward contracts. Good Durham descriptions are from 7s. 10½d. to 8s. 4½d. per ton generally, with an occasionally higher price from collieries that have a large part of their output contracted for, and can thus ask good prices for the small surplus. Some contracts have been entered into for gas coal for one or two German cities. Prices seem to have varied from 7s. 7d. to 7s. 10½d. per ton f.o.b.; but these figures may be modified by the allowance for freight. In one of these contracts, it is believed that a larger proportion of German coals is to be taken. The coke trade is brisk, with firmer, and in some cases higher, prices; but the abundance of gas coke at this season of heaviest output makes it rather difficult for some works to keep down their stocks.

Scotch Coal Trade.

There is a better demand, both for shipping and land sale, and prices have advanced slightly. There is, however, as yet little business doing for next year; buyers apparently being of opinion that they will get better terms when the winter is further on. The consumption of coal in public works has been increasing gradually of late, which is the explanation of the present improvement in prices. The rates quoted are: Main 7s. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. 3d. to 8s. 9d., and splint 8s. 6d. to 9s. The shipments for the week amounted to 233,679 tons—an increase of 7351 tons upon the preceding week, and of 3388 tons upon the corresponding week of last year. For the year to date, the total shipments have been 11,346,166 tons—an increase of 427,846 tons upon the corresponding period.

TRADE NOTES.

The New Export Company's Inverted Burner.

The New Export Incandescent Lighting Company have produced a cheap inverted incandescent burner. In calling attention to it, they say not only is it cheap, but it is of good quality and appearance. "It burns little gas, and gives off no smoke or smell. Having no top cover, it burns freely, and with plenty of air, and cannot deposit soot."

Diaries and Calendars for Next Year.

We have received from Simon Carvès, Limited, of Manchester, one of their date-blocks for the ensuing year. It is tastefully mounted, and arranged for standing on a table or hanging up. The day and date are boldly printed in chocolate ink, and they are accompanied by an appropriate quotation. Messrs. John Walsh and Sons, of Halifax, have sent us one of their pocket-books for next year. The firm have had considerable experience as retort-setters and furnace-builders, and illustrations of their work are given. The diary is arranged with three days on a page; the omission of Sunday giving a week at each opening. The pocket-book contains an insurance coupon for £1000 with the Ocean Accident and Guarantee Corporation, Limited. We have also received a combined almanac and pamphlet (in Italian) from our contemporary "Il Gaz." It contains some useful information in regard to the various ways in which gas can be employed, and shows how economical an agent it is for the production of light, heat, and power. Other diaries and almanacs have been received from the Winstanley Speciality Company, of Birmingham, and from Messrs. Clayton, Son, and Co., Limited, of Leeds.

A Fatal Acetylene Explosion.—An inquest was held at Liverpool last Tuesday, on the body of an apprentice plumber named Monroe (aged 17), who was killed by an explosion while experimenting with a projected acetylene generator. Mr. C. R. Bellamy, the City Lighting Engineer, who gave evidence at the request of the Coroner, explained the process by which acetylene gas is evolved, and said the idea to which Monroe had applied his ingenuity was one which was very widely entertained. Scores of deaths had resulted from similar experiments, as they required to be conducted with the utmost skill and care. The apparatus which Monroe had preparad was very crude; and any test made with it was necessarily attended with much danger. In all probability the deceased had mixed an amount of carbide of calcium which was out of proportion to the capacity of the gasholder. An escape would follow, aad if there were any light in the neighbourhood a forcible explosion was bound to result. The Coroner thanked Mr. Bellamy for his assistance, and added that the case should be a warning to young inventors. A verdict of "Accidental death" was returned.

PARKINSON'S

GAS-FIRES.

The "SAPPHIRE."

Elegant in Design.

Burner removable without disconnecting Fire.

Latest Improvements.

Most substantially made.

Suitable for Hiring out.

PARKINSON AND W. & B. COWAN, LTD.,

(PARKINSON BRANCH),

COTTAGE LANE, CITY ROAD, LONDON. | BELL BARN ROAD, BIRMINGHAM.

A Result of the Gas Exhibition.—At the meeting on Monday last week of the West Ham Education Committee, it was reported that a Sub-Committee who had visited the International Gas Exhibition at Earl's Court had made arrangements with Messrs. W. Sugg and Co. for the installation of different systems of gas lighting to be carried out as experiments, during the Christmas vacation, on one floor in each of the Water Lane and Upton Lane Schools.

The Quality of the South Suburban Company's Gas.—The Lewisham Borough Council had under consideration last Wednesday a report from the General Purposes Committee recommending that proceedings be taken by summons against the South Suburban Gas Company for having, on the 28th of November, according to the test of the Gas Examiner, supplied gas having 34·92 grains of sulphur per 100 cubic feet, or nearly 15 grains in excess of the limit. The report and recommendation were adopted.

Mr. Robert Hammond and the Corporation of Dublin.—The Dublin Electric Lighting Committee have unanimously decided that the electric lighting scheme and its working shall be kept in the hands and control of the Corporation. Mr. Robert Hammond's offer to take over the undertaking on terms which were recently stated in the "JOURNAL," was not considered. Already loans to the amount of £392,747 have been sanctioned by the Local Government Board in connection with electric lighting; and two further loans aggregating £49,000 have been inquired into. To this, however, has to be added the estimated sum of £60,000 necessary to meet further expenditure to Dec. 31, 1906; making a total of £501,000.

Electric Shop Lighting at Maidstone.—In moving at the Council meeting the adoption of the report of the Electric Lighting Committee, the Chairman (Mr. E. Vaughan) referred to a recommendation that arc lamps should be supplied on hire for lighting the outside or inside of shops at a cost of 6s. per lamp per annum, including trimming and keeping in repair. The Committee, he said, were endeavouring to compete with the Gas Company so far as the outside lighting of the shops was concerned. He was forced to admit that up to the present time the Committee had been beaten; but they did not intend to lie down under the stigma, and he thought the recommendation would prove a very satisfactory means of competing with the Company

Unreliability of the Electric Light.—On Monday last week, there was a dense fog in London; and next day the following communication from a patient in a well-known West-End Nursing Home appeared in the "Daily Chronicle." "At 9 o'clock a.m., I was on the point of undergoing a serious operation. Everything was in readiness—five distinguished doctors being present—when to our utter consternation the electric lights were suddenly extinguished. Surgeons, nurses, and patient all watched with bated breath for the return of a dawning light which never came. After half-an-hour's precious time had been wasted, and seeing that the light was merely beginning to fluctuate, the surgeons sadly shook their heads and departed, leaving me to nerve myself to again face the dreaded ordeal on the morrow. What would have happened had the operation been timed for fifteen minutes sooner, one trembles to think. I ask, Cannot something be done in order to supply London with a more stable and efficient service of electric light?"

Charges for Water Used on Gardens.—The Cambridge Water Company announce that, as from March 25 next, the following revised scale of charges and conditions for the supply of water to gardens will come into force: Persons who have less than 5 perches of land attached to their houses, will be allowed to water it without any extra charge, providing they do not use a hose, in which case they will be called upon to pay 6s. a year. The charge for plots between 5 and 10 perches will be 2s. a year, with 2s. for every additional 10 perches. In the case of private gardens not attached to houses, the fee levied will be 8s. per annum, and 4s. for every additional 10 perches or less. The rates will in these instances be also double for hose, which must be held by the person using them. This regulation has been devised to prevent people leaving them on the ground, with the water running to waste unchecked. In case it is desired to use lawn sprinklers in any other way, the Company will only supply water by meter.

Over-Expenditure on the Warrington Water-Works.—At the last meeting of the Warrington Town Council, the Water Committee asked for permission to apply to the Local Government Board for power to borrow £20,510 to cover the amount overspent on the water-works undertaking under the powers contained in the Warrington Corporation Act, 1899, and the further sum required to complete the works. Alderman Francomb moved the adoption of the minutes, and stated that under their Bill the Council were authorized to borrow £147,000. This sum had almost exactly covered the work intended; but they had found such an excess of water that a great deal of money had had to be spent on pumping. It had been almost impossible to get through the work, and for the additional expenditure they would have this extra water supply. Mr. Pemberton moved, as an amendment, that the matter be referred back; alleging that money had not been applied according to the specifications. The amendment was carried.

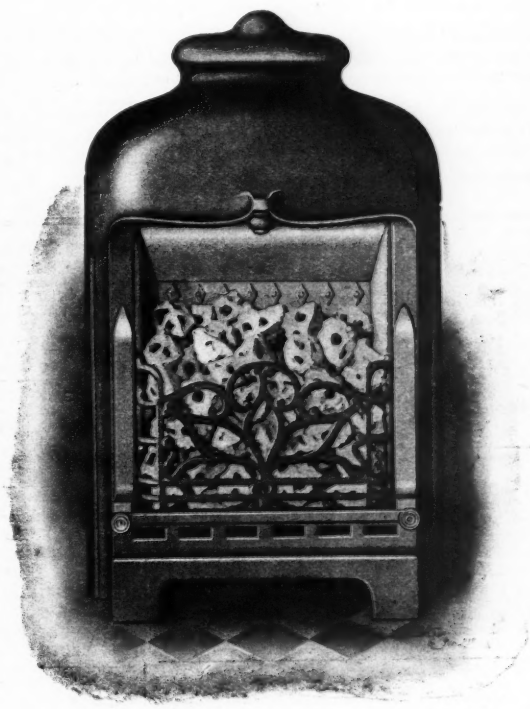
The Wandsworth Borough Council accepted last Wednesday the tender of the South Metropolitan Gas Company, at £28, for altering the lighting at the Clapham Library.

Robinson, Cooks, and Dynamic Gas, Limited, is the title of a Company which has been registered with a capital of £60,000, in £1 shares, to acquire the business, property, patents, and undertaking of the Dynamic Gas Company, of Spinningfield, Deansgate, Manchester, and the undertaking, freehold and leasehold premises, plant, and other property of Messrs. Robinson, Cooks, and Co., of the Atlas Works, St. Helens, to adopt certain agreements, and to carry on the business of mechanical, electrical, hydraulic, gas, and general engineers, manufacturers of gas-producing plant, gas-engines and machinery, gas manufacturers, founders, metal workers, &c.

The "MAIN"

Gas Fires

NEW AND ARTISTIC DESIGNS.



Burner and Bricks removable; extra deep Fire.

The "WESTMINSTER" No. 1030 . . £2

R. & A. MAIN, LTD.,

LONDON. GLASGOW. FALKIRK, &c.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

REPRESENTATIVE (GAS AND ELECTRIC). No. 4311.
REPRESENTATIVE. Dixon and Co., London.
GAS-WORKS ERECTOR. No. 4312.
CANVASSER. Isle of Wight Gas Association.
SUPERINTENDENT. Sheffield Gas Company. Applications by Jan. 12.

Situation Wanted.

INCANDESCENT MANTLE MANUFACTURE. No. 4313.

Plant for Sale.

STATION GOVERNORS. R. Dempster and Sons, Elland.

Stocks and Shares.

CITY OF NORWICH WATER COMPANY. Dec. 31.
GUILDFORD GAS COMPANY. Jan. 17.
LOWESTOFT WATER AND GAS COMPANY. Jan. 17.
MAIDENHEAD GAS COMPANY. Jan. 17.
NEWCASTLE AND GATESHEAD WATER COMPANY. Jan. 17.
REDHILL GAS COMPANY. Jan. 19.
SOUTHGATE AND DISTRICT GAS COMPANY. Jan. 17.

TENDERS FOR

Coal.

COPENHAGEN LIGHTING DEPARTMENT. Tenders by Jan. 16.

Meters (Ordinary and Prepayment).

CLACTON GAS DEPARTMENT. Tenders by Jan. 11.

Tar and Ammoniacal Liquor.

CLACTON GAS DEPARTMENT. Tenders by Jan. 11.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.
Apply to E. PADFIELD AND CO., 96 & 98, Leadenhall Street, LONDON, E.C.

GASHOLDER PAINTING.
PAINTING Work for all kinds of Gas- Works Plant undertaken by contract or otherwise.
FREDERICK BOYALL, 31, Regent's Row, Queen's Road, DALSTON, N.E. Established 1850.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.** Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
See our exhibit at the International Gas Exhibition, Earl's Court, Nov. 19 to Dec. 17.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

THE HANWELL PATENT RISING & FALLING GAS PENDANT (described in the JOURNAL for Nov. 22, p. 599).
Write for full Particulars to THE HANWELL PENDANT COMPANY, Abington Street, NORTHAMPTON.

INCANDESCENT Mantle Manufacture. Advertiser, with valuable experience of Factory Management and a Thorough Knowledge of the various processes worked throughout Europe, is open to Engagement, preferably in England.
Address No. 4313, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

BROTHERTON & CO., LIMITED. Offices: Commercial Buildings, LEEDS. Correspondence invited.

SPENT OXIDE.
THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

WANTED, a young Man to undertake the erection of small Gas-Works. Must be able to supervise all work, fix Gas Pipes and Fittings, adjust all types of Burners, and test plants erected. Bachelor preferred.
Apply, by letter, stating Age, Salary expected, and previous Experience, to No. 4312, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Isle of Wight Gas Association require a Smart Man of good address with a practical knowledge of Modern Methods of Lighting and able to give Estimates for Gas Fitting, to canvass the householders in various towns in the Isle of Wight.
Apply, by letter, giving Age, Experience, and References or Testimonials, and stating Salary required, to
E. H. MILLARD,
Hon. Sec.
Gas-Works, Cowes.

SHEFFIELD UNITED GAS LIGHT COMPANY.
THE Directors of this Company require a SUPERINTENDENT for their Neepsend Gas-Works. Preference will be given to one who has been used to Regenerative Furnaces and Mechanical Stokers. The maximum make of Gas at this Station is about 8 Million cubic feet per day.
Commencing salary £300 per Annum, with House near the Works, Rent, and Rates free.
Applications, marked "Superintendent," stating Age whether Married or Single, and previous Engagements, to be made by letter only, addressed to the undersigned, and must be delivered by post, not later than Thursday, Jan. 12, 1905.
HANBURY THOMAS,
General Manager and Secretary.
Commercial Street,
Sheffield, Dec. 22, 1904.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

AMMONIACAL LIQUOR wanted. Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, and Wakefield.

GAS and Water Works Supplies and Construction Company, Limited, are open to purchase small or large Gas-Works. Constructors for all Gas and Water Work and Main Laying. All Gas and Water Works Plant and Fittings supplied. Gas and Water Works Financed. Shares and Stock accepted in part payment for Work and Materials supplied. Gas and Water Works Shares and Stock Underwritten and Issued.
London Office, 99, Cannon Street, E.C.

THE Sirius Electric Distant Gaslighter Company require SOLE REPRESENTATIVE for Great Britain. Splendid opportunity for an independent energetic business Man of some means. Gas Companies may also apply.
For Particulars please apply to H. Dixon and Co., Ltd., 81, High Holborn, London, W.C.

GAS AND ELECTRIC LIGHTING TRADES.
WANTED by a large Firm of Manu- facturers, an exclusive REPRESENTATIVE for London and District. Highest References, and Good Connection essential.
Apply, by letter, to No. 4311, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. Wright, 181, Queen Victoria Street, London, E.C.

FOR Sale, equal to new, a 12-in. Cowan's STATION GOVERNOR; also one 10-in. Gas Meter Company's, in first-class condition.
Apply for particulars to Robert Dempster & Sons, Ltd., Elland.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

CLACTON URBAN DISTRICT COUNCIL.

GAS-METERS.

THE above Council are prepared to receive TENDERS for the supply of Prepayment and Ordinary METERS.
Full Particulars can be obtained upon application to Mr. Sydney Francis, A.M.I.M.E., the Council's Consulting Engineer, Town Hall, Clacton-on-Sea.
Tenders, sealed and endorsed "Tender for Meters," to be delivered to the undersigned not later than Four o'clock p.m. on Wednesday, the 11th of January next.
The Council do not bind themselves to accept the lowest or any Tender.

Geo. T. Lewis,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea, Dec. 19, 1904.

CLACTON URBAN DISTRICT COUNCIL.

TAR.

THE above Council are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works for the ensuing Twelve Months.
Particulars can be obtained from Mr. Sydney Francis, A.M.I.M.E., the Council's Consulting Engineer, Town Hall, Clacton-on-Sea.
Sealed Tenders, endorsed "Tender for Tar," to be delivered to the undersigned not later than Four o'clock on Wednesday, the 11th of January next.
The Council do not bind themselves to accept the lowest or any Tender.

Geo. T. Lewis,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea, Dec. 19, 1904.

TENDERS FOR GAS COAL.

THE Lighting Department of Copen- hagen is prepared to receive TENDERS for the supply and delivery of 150,000 Tons of best GAS COAL from the beginning of March until the end of December, 1905.
The Lighting Department reserves the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Direktoren for Kjobenhavns Belysningsvæsen, Vester Boulevard 22, Copenhagen B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Direktoren for Kjobenhavns Belysningsvæsen, Vester Boulevard 22, Copenhagen B, before the 16th of January, 1905, Twelve o'clock, at which time the Tenders will be opened in the presence of the Parties tendering who are in attendance.

The Lighting Department of Copenhagen.
Dec. 17, 1904.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to Capital Stocks WILL BE CLOSED at Four o'clock p.m. on Tuesday, the 3rd day of January next, and will be RE-OPENED immediately after the Half-Yearly Ordinary General Meeting of the Company to be held on the 3rd day of February next.

By order,
Henry Rayner,
Secretary.

Chief Office, Horseferry Road,
Westminster, S.W., Dec. 21, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

By order of the Directors of the
GUILDFORD GAS LIGHT AND COKE COMPANY.

NEW ISSUE OF £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, 1905, at Two o'clock, in Lots.
Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES,

Ranking for a Maximum Dividend of 7 per cent.; previous issues of similar Shares now receiving 5½ per cent.; also

£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, 1905, at Two o'clock, in Lots.
Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
MAIDENHEAD GAS COMPANY.

NEW ISSUE OF £5000 CONSOLIDATED ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, at Two o'clock, in Lots.
Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

By order of the Directors of the
SOUTHGATE AND DISTRICT GAS COMPANY.
(Formerly called the Colney Hatch Gas Company.)

NEW ISSUE OF £4000 ADDITIONAL ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 17, 1905, at Two o'clock, in Lots.
Particulars of the Auctioneer, 18, Finsbury Circus, E.C.

REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER, £5000 OF ORDINARY "B" STOCK of, and in the, Redhill Gas Company.
The last day for the reception of Tenders will be Thursday, the 19th day of January, 1905, at Twelve o'clock, at Noon.
Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon application at the Company's Office, Brighton Road, Redhill.

By order,
C. Read,
Secretary.

Redhill, Surrey,
Dec. 17, 1904.

RAILS.
New and Second-Hand with all Accessories; also Tip Waggons and Turntables.
B. M. RENTON,
MIDLAND WORKS,
SHEFFIELD.

CITY OF NORWICH WATER-WORKS COMPANY.

Incorporated by the City of Norwich Water-Works Act, 1850.

SALE BY TENDER OF 1000 £10 ORDINARY SHARES.

THE Directors invite Tenders (at not less than the value of £16 5s. per Share) for the purchase of 1000 ORDINARY £10 SHARES in the above-named Company. The Shares will be issued as fully paid, and will constitute a portion of the Additional Capital authorized to be raised under the powers and provisions contained in the City of Norwich Water-Works Act, 1898.
These Shares rank for a Maximum Dividend of 6 per cent. per annum, and the Dividends on similar Shares have for the last 13 Years been paid at the rate of 6 per cent. per annum.
Payment for the Shares is to be made on or before the 14th of January, 1905.
The Dividends are paid half-yearly, and will accrue from the 14th of January next.
Particulars, with Forms of Tender, may be obtained on application to the Secretary, to whom Tenders, marked "Tenders for Shares," must be delivered on or before the 31st of December next.

By order of the Directors,
G. Christopher Davies,
Secretary.

11, Prince of Wales Road,
Norwich, Nov. 14, 1904.

NEWCASTLE AND GATESHEAD WATER COMPANY.

SALE BY AUCTION OF £54,000 (or thereabouts) OF SEVEN PER CENT. MAXIMUM ORDINARY STOCK (Act 1898).

MR. CHARLES A. JOEL will Sell by AUCTION, at the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 17th of January, 1905, at Half-past Twelve o'clock in the Afternoon, £54,000 (or thereabouts) of 7 PER CENT. MAXIMUM ORDINARY STOCK, under the Act of 1898, in Lots of £100.
The above Stock is the balance of the 7 per cent. Maximum Ordinary Stock created under the powers of the Newcastle and Gateshead Water-Works Act, 1898.
The dividend is subject to proportionate diminution whenever the maximum dividend to which each class of Ordinary Stock of the Company is entitled shall not be paid in full; but such diminution may be made up in subsequent years.
Printed Particulars and Conditions of Sale may be had at the Company's Offices, and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 27, Northumberland Street, Newcastle-on-Tyne.

George Smith,
Secretary and General Manager.

Newcastle-on-Tyne, Dec. 7, 1904.

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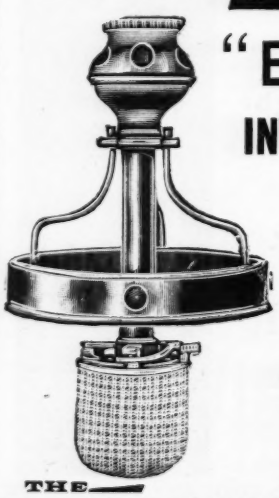

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Self-Intensifying Lamps.

Length overall.
604a 2 ft. 8 in.
604b 3 ft. 3 in.
604c 4 ft. 2 in.

Width overall.
Reflectors.
Enamelled. Opal.
604a 16½ in. 18 in.
604b 22 in. 24 in.
604c 24 in. 26 in.

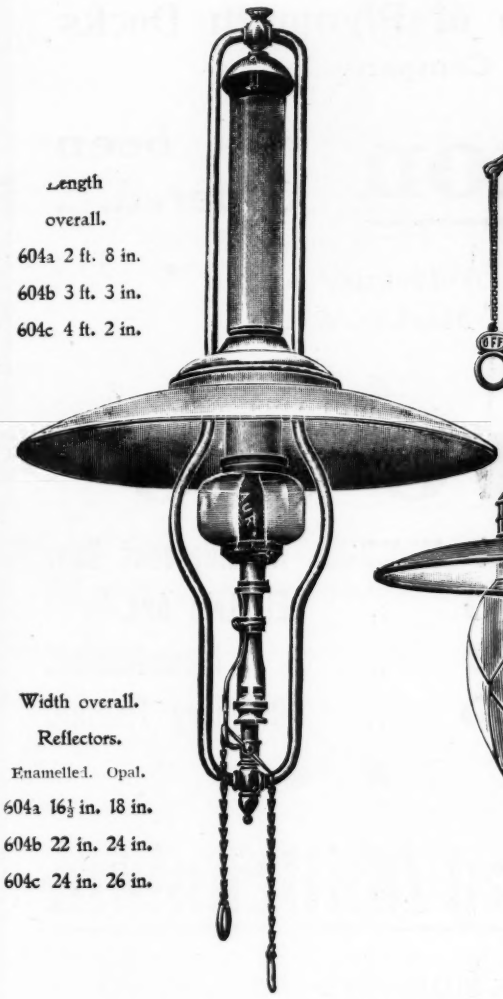

Fig. 604.

Interior Lighting. Enamelled.
A 5 ft. per hour, 150 c.p., £1 13 0
B 10 ft. „ 300 c.p., 2 8 0
C 20 ft. „ 600 c.p., 4 4 0

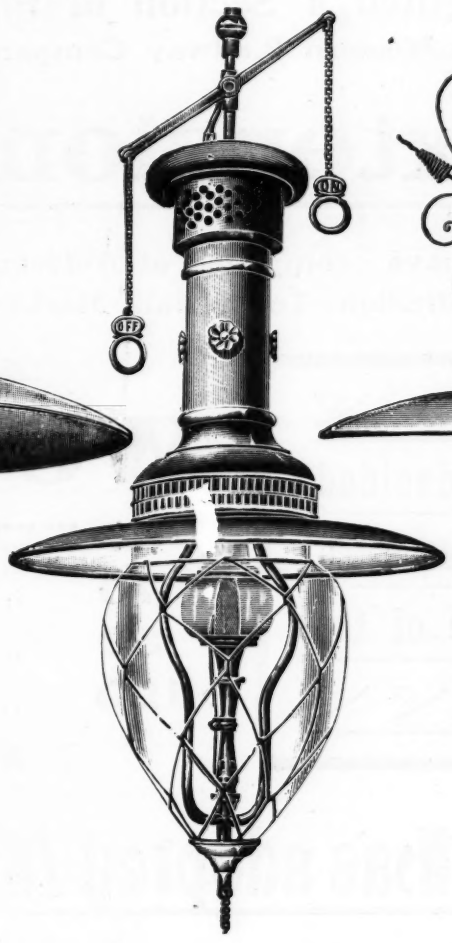

Fig. 607.

Overall.	Length.	Width.
607b	4 ft. 4 in.	24 in.
607c	5 ft. 0 in.	29 in.

Storm Proof Arc. Enamelled Reflector, Cup and Ball Joint, Lever Tap and By-pass.
607b 10 ft. per hour, 300 c.p. £5 0 0
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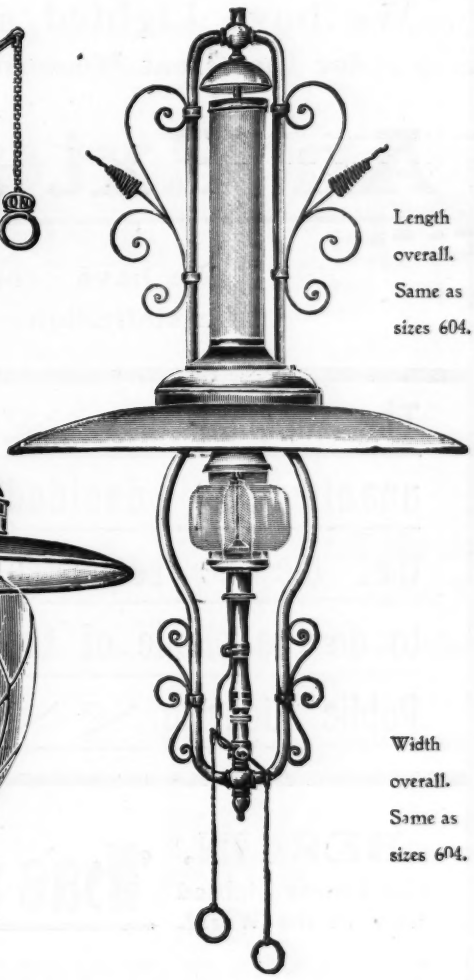

Length overall. Same as sizes 604.

Width overall. Same as sizes 604.

Fig. 605.

Interior Lighting (Ornamental).
605a 5 ft. per hour, 150 c.p., £2 5 0
605b 10 ft. „ 300 c.p., 3 1 6
605c 20 ft. „ 600 c.p., 5 0 0

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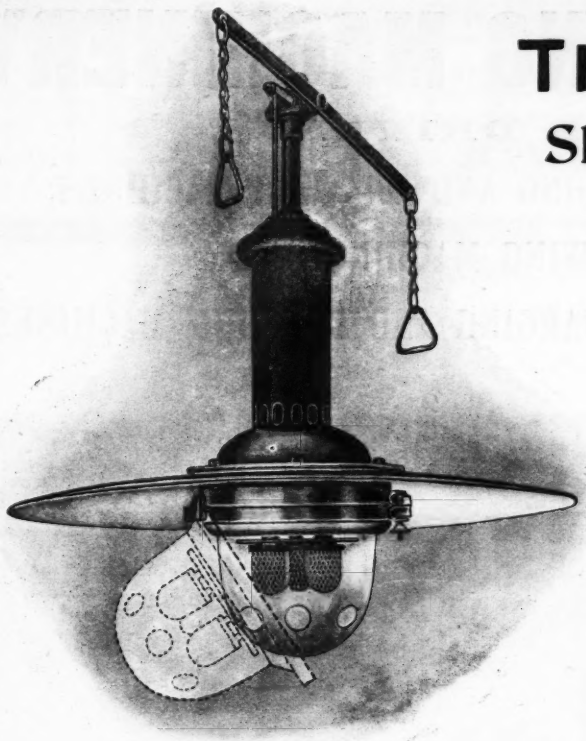

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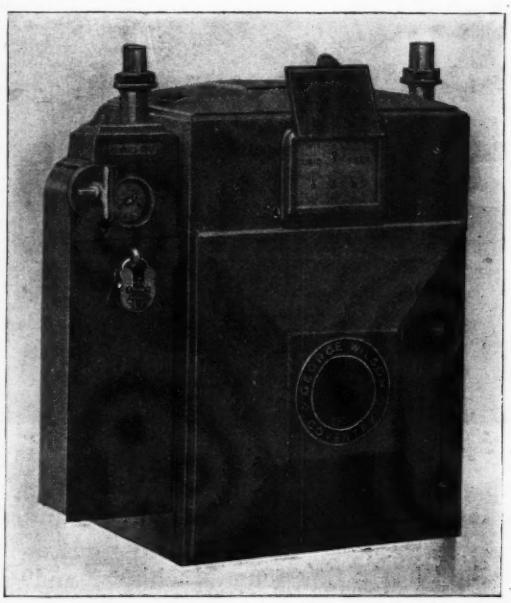

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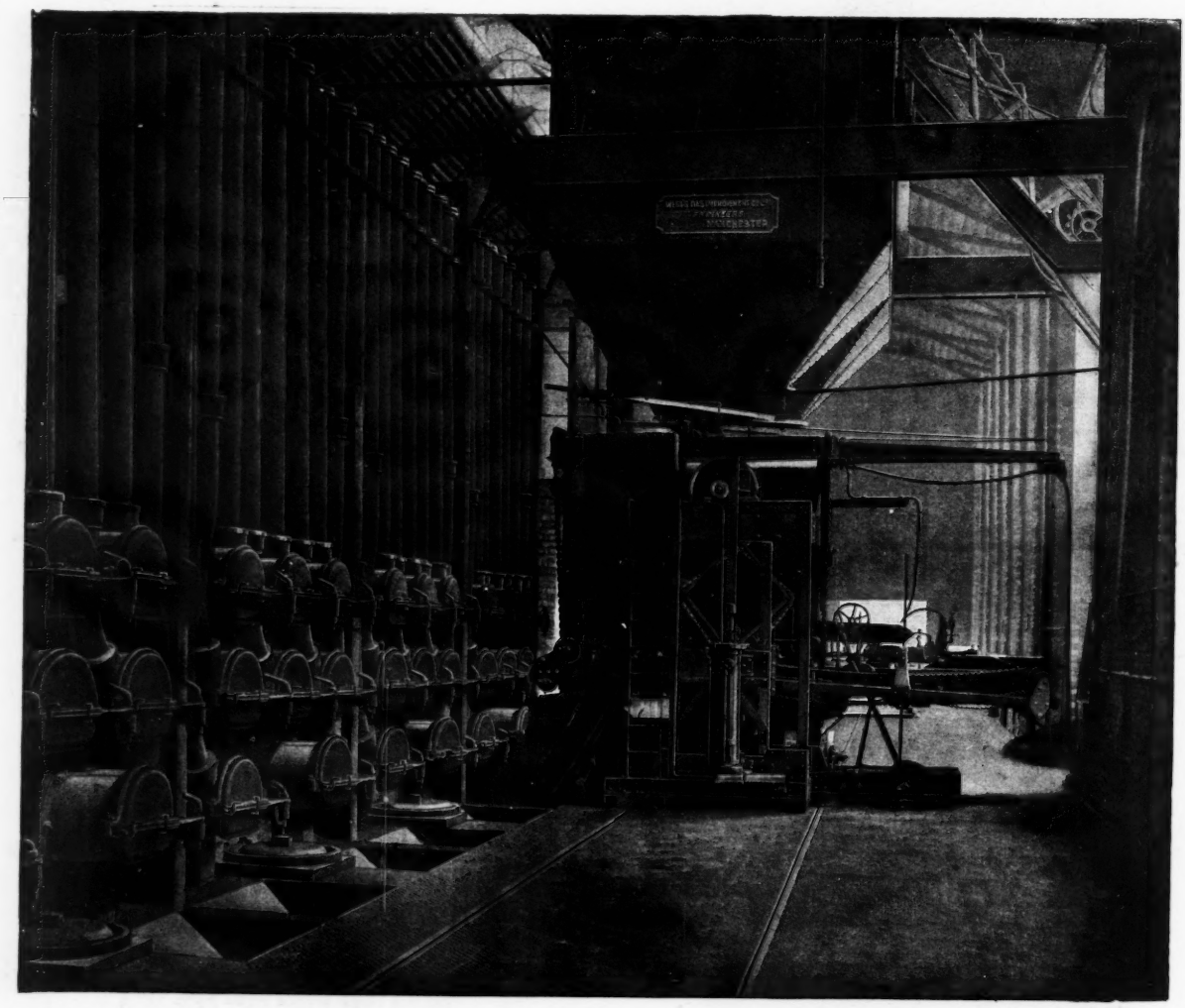

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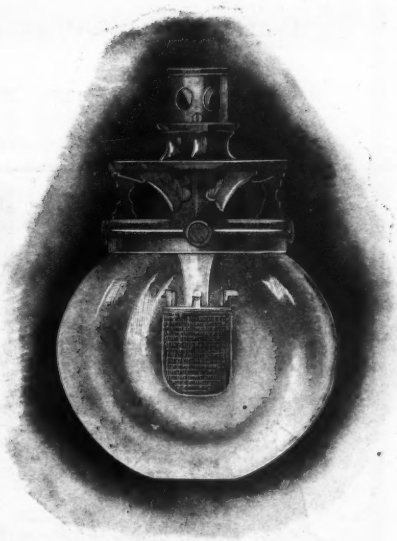

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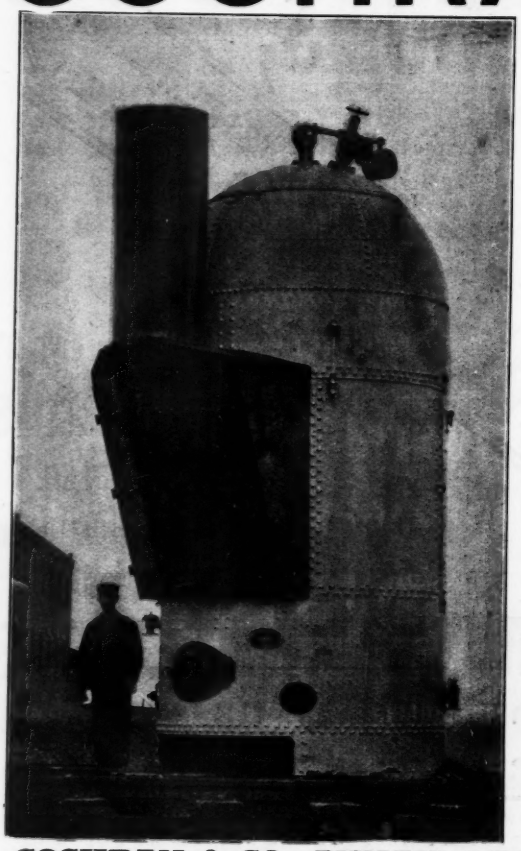

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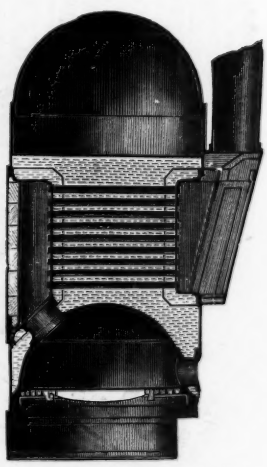

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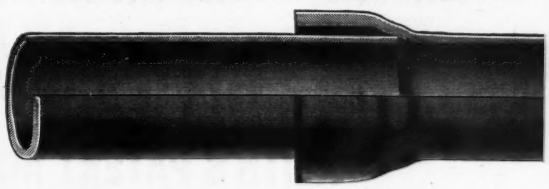

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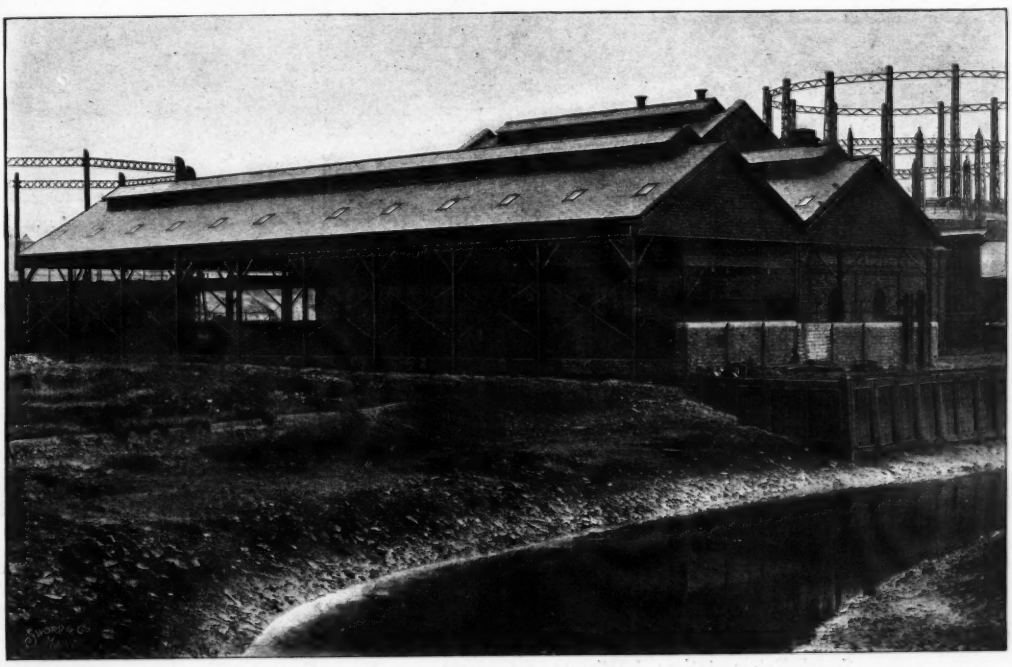

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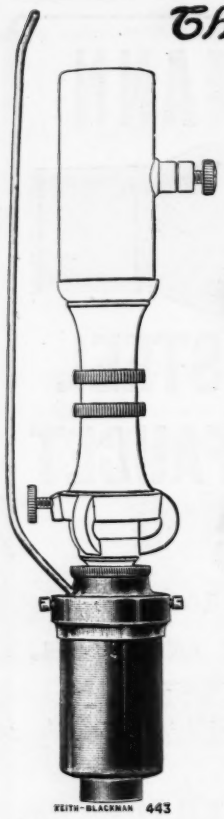

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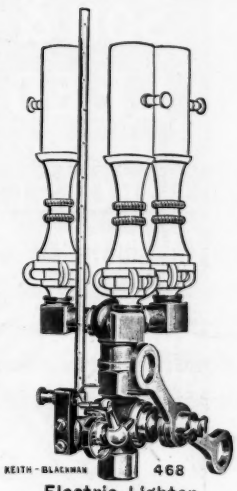

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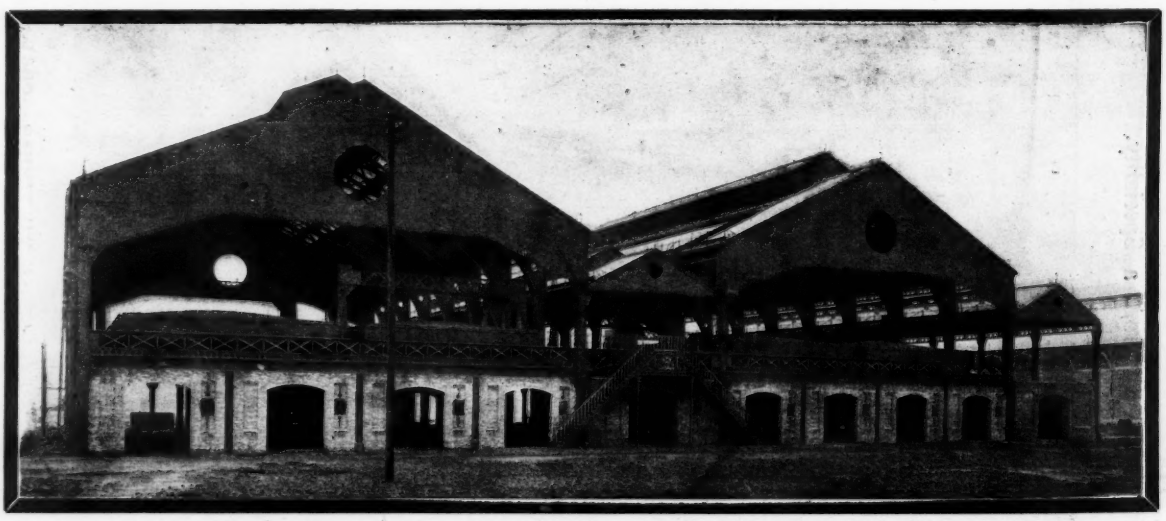

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Printed for WALTER KING, by King, Sell, and Olding, Ltd.; and Published by him at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Dec. 27, 1904.

UNIV. OF MICH.

THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

[REGISTERED AS A NEWSPAPER.

VOL. LXXXVIII. No. 2172.] LONDON, DECEMBER 27, 1904. [56TH YEAR. PRICE 6d.

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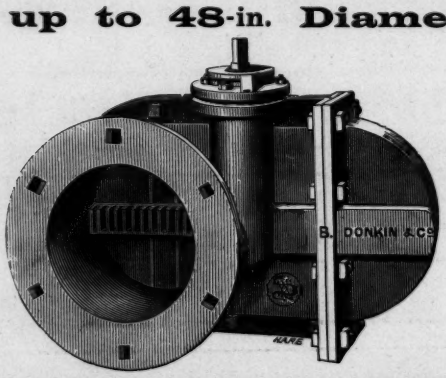

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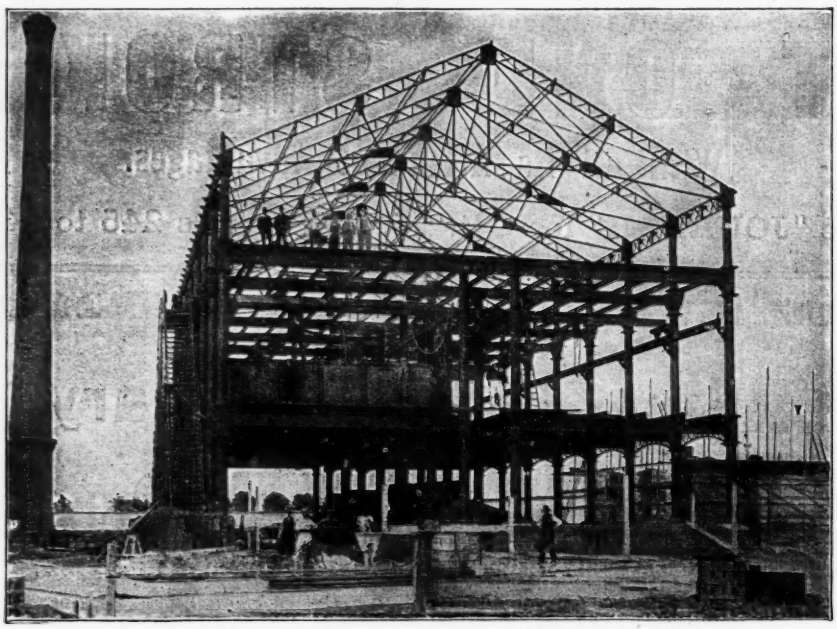

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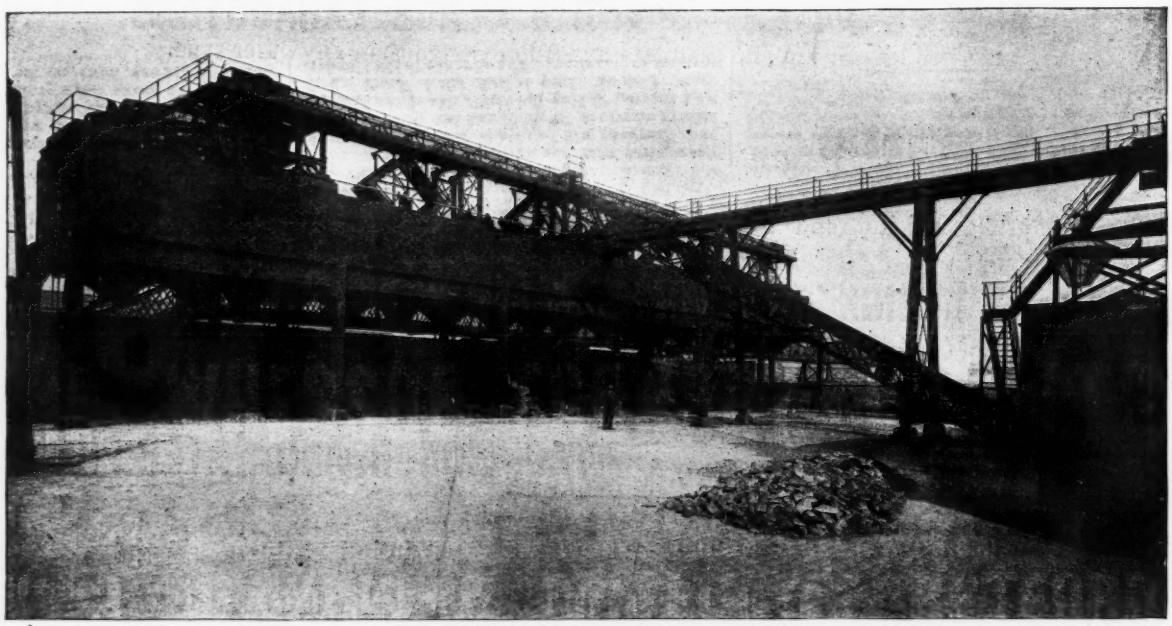

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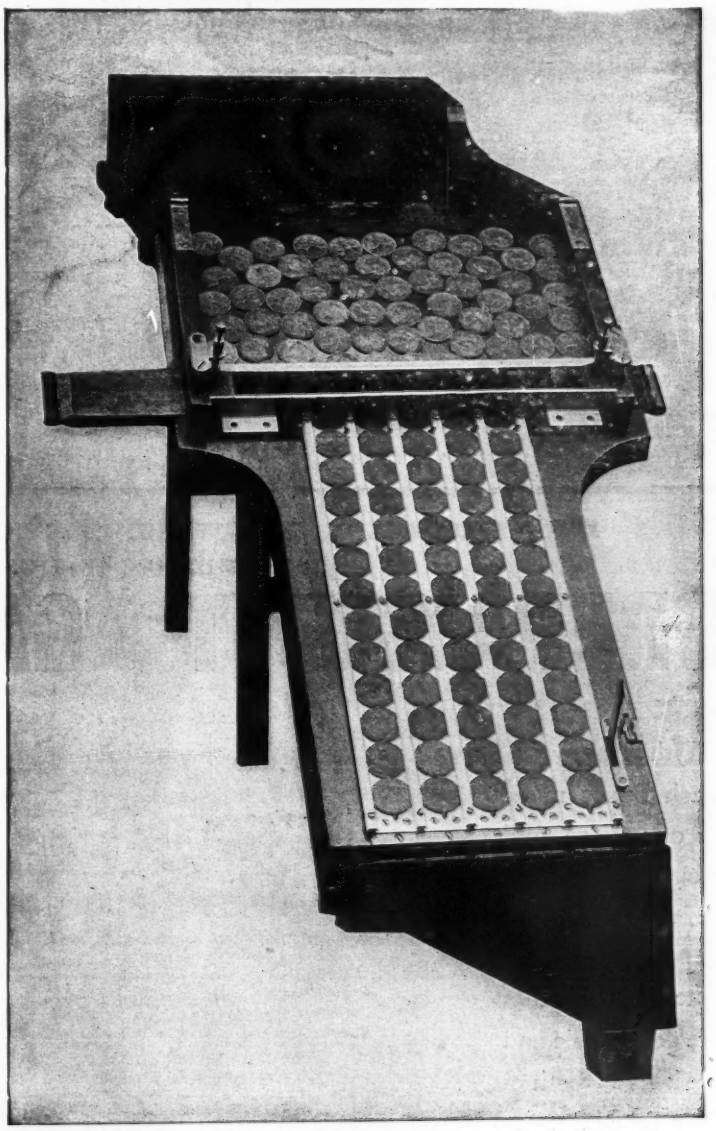

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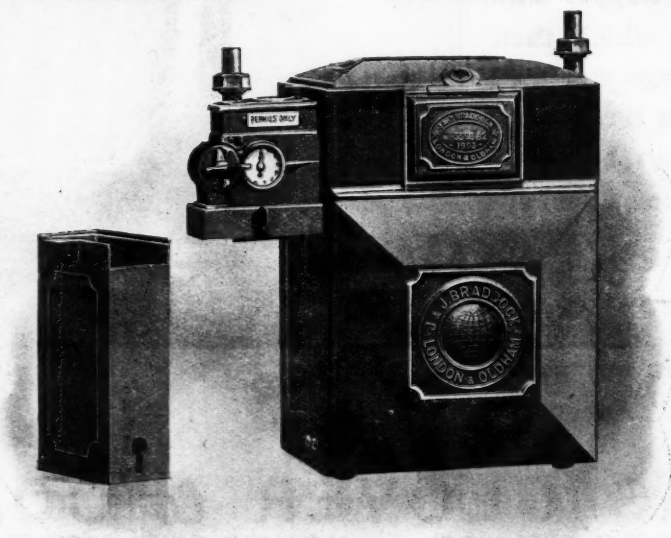

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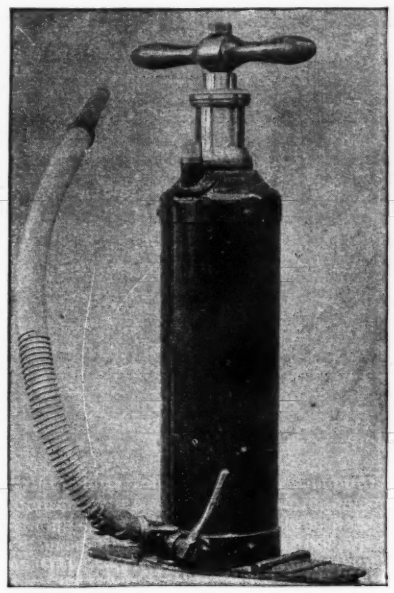

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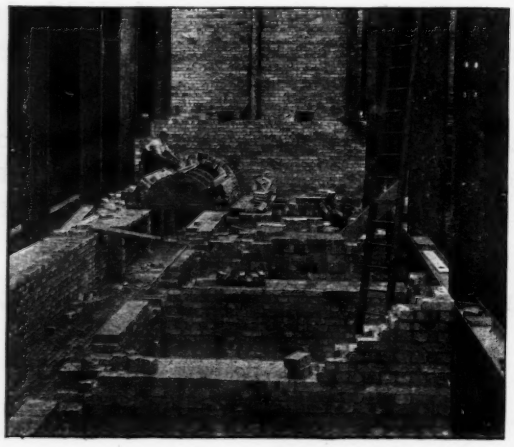

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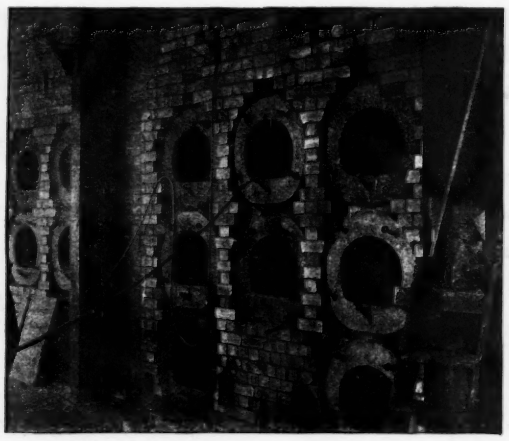

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Leakage at the index box is effectually prevented by the adoption of a grease cup in connection with the ordinary stuffing-box. A prolonged experience of this modification, which we introduced in 1878, justifies its recommendation as a substantial improvement.

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All the sizes of these Meters are of neat design, and are unexcelled for workmanship, material, and finish. The most careful supervision is exercised at every stage of their manufacture, and only the highest class of skilled labour is employed.

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